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WILDLAND FIREFIGHTER SAFETY AWARENESS STUDY

Phase III—Implementing Cultural Changes for Safety

March 1998

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UNITED STATES DEPARTMENT OF THE INTERIOR

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Information Bulletin No. OF&A 98- 041

To: State Directors and Center Directors

From: Director, Office of Fire and Aviation

Subject: Wildland Firefighter Safety Awareness Study - Phase III, Implementing Cultural Changes for Safety

The purpose of this memo is to transmit the subject document and strongly recommend that it be distributed and reviewed by agency administrators, fire, and safety personnel.

The subject study has produced three reports by the TriData Corporation. The Phase III report culminates the study of the fire safety culture and makes recommendations on how the five wildland firefighting agencies can achieve the desired safety culture. The Phase III report identifies 86 goals and 241 implementation strategies that focus on that culture.

The Federal Fire and Aviation Leadership Council (FFALC) has adopted the principles outlined in the Phase III report. A field team representing a cross section of line management, safety, and fire personnel are meeting June 1-5, 1998, to evaluate and prioritize the goals and strategies. That prioritization will be presented to the FFALC for approval and implementation. We will all be involved in these efforts and intend to keep you informed of our progress.

As you read the Phase III report, you will note that many of the implementation strategies can be achieved at the field level with no new policy or guidance. You may also note that many of the strategies apply to the safety program in general, not just as it applies to fire. We hope this report will serve to facilitate dialog between you and your employees as we all strive to improve the safety culture for firefighters.

Questions regarding the Phase III report, or requests for additional copies, may be directed to Sandy Guches at 208-387-5175.

RON DUNTON
Acting

1 - Attachment
1 - Wildland Firefighter Safety Awareness Study, Phase III (357 pp.)

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WILDLAND FIREFIGHTER SAFETY AWARENESS STUDY

Phase III—Implementing Cultural Changes for Safety

March 1998

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P.O. Box 25047
Denver, CO 80225

Prepared by
TriData Corporation
1000 Wilson Boulevard
Arlington, Virginia 22209

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- USDA Forest Service
- USDI Bureau of Land Management
- USDI National Park Service
- USDI Bureau of Indian Affairs
- USDI Fish and Wildlife Service

As in the earlier phases, Phase III of this study was given guidance by the Fire Directors of the five federal agencies that sponsored this project; the Project Steering Committee; and the Federal Fire and Aviation Safety Team (FFAST). The members of these committees and the fire directors also graciously shared their personal views about safety. They are as follows:

Agency Fire Directors	*Project Steering Committee*	*Federal Fire and Aviation Safety Team (FFAST)*
Mary Jo Lavin, FS	Mark Boche, FS	
Rick Gale, NPS	Steve Frye, NPS	Dave Aldrich, FS
Roger Erb, FWS	Jerry Williams, FS	Paul Broyles, NPS
Steve Haglund, BIA	E.K. James, BLM	Roy Johnson, BLM
Les Rosenkrance, BLM		Bob Martin, FS
		Mike Martin, DOI
		Carlos Mendiola, FWS
		Stan Palmer, BLM
		Mike Wallace, BIA

Also providing advice and comments to this project were Mike Apicello, National Interagency Fire Center; Doug Erskine, National Park Service; Carl Halgren (Occupational Safety and Health Administration), and Mike Edrington, Forest Service, Buck Latapie, Forest Service; and Jim Cook, Forest Service.

William Bradshaw of the U.S. Forest Service coordinated this project, as the Contract Officer's Representative. Kathleen Shriver of the Bureau of Land Management

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Project Team

TriData Corporation of Arlington, Virginia was the prime contractor for this project. It was assisted by Klein Associates and several independent consultants. The key team members for Phase III are listed below:

TriData Corporation

Philip Schaenman, Project Manager
Roy Hodges
Charlene Cullen
Christine Cross

Klein Associates Inc.

Gary Klein
Marvin Thordsen

Principal Consultants

Michael DeGrosky
Charles Perrow
Nancy Moore-Hope
Robert Mutch
Jason Greenlee

Other Consultants

Lark McDonald
Patrick Withen

EXECUTIVE SUMMARY

This Phase III report of the interagency "Wildland Firefighter Safety Awareness" project presents over 200 recommendations for improving the organizational culture, leadership, human factors and external influences that affect wildland firefighter safety. Together they are a set of detailed implementation strategies for meeting the 85 goals for improving firefighter safety that were developed in Phase II in response to the problems and solutions suggested by the 1,000 wildland firefighters surveyed in Phase I, plus one goal added in Phase III.

Background

The five Federal agencies most involved in wildland firefighting – the Forest Service, Bureau of Land Management, National Park Service, Bureau of Indian Affairs, and Fish and Wildlife Service – chartered a study in 1995 to identify and change aspects of the underlying organizational culture that negatively impact firefighter safety. The study was undertaken by an outside consulting firm, TriData Corporation of Arlington, Virginia. This report summarizes the results of the third phase of the study – implementation recommendations.

In the first phase of the study, over 1,000 wildland firefighters provided us with their personal observations on the factors that affect safety, and their recommendations for improvements. This was done through in-depth, one-on-one interviews or focus groups involving 300 firefighters, and from responses to a 25-page survey form from another 700 firefighters.

We also searched the literature on wildland firefighting safety and related safety fields for insights and ideas, and interviewed many experts in wildland firefighting and safety research.

The issues identified ranged from detailed problems such as the lack of adequate distribution of radios to some Type II crews, and the dangers of transporting crews in school buses driven recklessly on mountain roads, to broader organizational culture and leadership issues such as lack of adequate leadership training, lack of adequate two-way

dialogue in communications, a lack of incentives (and even disincentives) for experienced firefighters to return each year, inadequate training to compensate for the drop in experience, and many, many other factors. We heard comments like the following:

> *We understand the science of fighting fires, but we do not understand the science of people fighting fires.*
>
> *Fatigue is a particular problem on campaign-type fires...It creates the walking dead.*
>
> *One in five division supervisors is really scary.*

The Phase I report described in detail the wide range of problems found, and the weighting of their importance.[1]

The second phase of the study started with the problems and solutions identified in Phase I, and developed a set of 85 goals that taken together describe the desired wildland firefighter culture of the future.[2]

The third phase of the study, described in this report, developed specific recommendations on how to move from the current situation to the desired future culture. Firefighting is an inherently dangerous undertaking that cannot be made risk-free. However, we are not doing a good enough job of managing the risks, and avoiding putting people into situations where entrapment or serious injury may occur. Together the recommendations here respond to virtually all of the safety concerns identified in Phase I. The results of this study provide the tools to make the culture of wildland firefighting a self-learning, self-correcting system.

In the following pages we first discuss an overall framework for change, and then summarize what were felt to be some of the most important areas and specific ideas for implementing change. The full list of goals and the recommended implementation strategies for each are provided at the end of the Executive Summary. We urge those

---

[1] *Wildland Firefighter Safety Awareness Study –Identifying the Organizational Culture, Leadership, Human Factors, and Other Issues Impacting Firefighter Safety*, October 1996.
[2] *Wildland Firefighter Safety Awareness Study – Setting New Goals for the Organizational Culture, Leadership, Human Factors, and Other Areas Impacting Firefighter Safety*, February 1997.

interested in safety to read the entire report because many of the findings are interrelated, and there are so many needed improvements across so many topics that it is difficult to summarize them without overgeneralizing. The old saying "the devil is in the details" applies here.

A Framework for Culture Change

The ***culture change process*** is a two-sided coin. On one side is the "bottom-up" phenomenon that many changes arise from those actually doing the work. On the other side is the "top-down" reality that changes in conducting business often get made by direction or sanction from top management. Both are essential. People at all organizational levels need to be on board since workers can resist change ordered from the top or management can stifle change started at the bottom. Changing the organizational culture as it relates to wildland firefighter safety will require commitment at every organizational level. Gaining that commitment will take a concerted, systematic effort to involve people from all levels in determining the details of the strategies to be pursued.

A second issue in determining cultural change is the role of ***leadership***. Cultural change is not triggered by a magic bullet or a directive. Rather, culture is changed by a series of small steps taken by the leading members of the culture at all levels. Leadership is standing up and leading the way. It is behavior and it is demonstrable. It is showing, not telling. Both sides of the change process offer opportunities for leadership – from management and from firefighters and supervisors. Changing the way business is conducted requires people at all levels to lead by personal example in demonstrating new approaches to achieve safer operations. Management must solicit and support suggestions on ways to improve operations; the process cannot be delegated to a committee. Management must demonstrate its willingness to make positive changes, whether they are initiated by management or by firefighters.

A third major issue in this cultural change process is ***accountability***. One of the strongest cries heard during the Phase I interviews of this study was to strengthen accountability at all levels of the organization – firefighters, Crew Supervisors, fire managers, and up. The truly remarkable aspect of that cry was that it did not just point fingers at some vague group of "others," "them," or "management." Rather, five of the

six top safety issues identified by firefighters focused on personal firefighter actions. All ranks were represented on the survey, and there was excellent consensus that change required strong accountability throughout the wildland firefighting system to make it work well. Accountability is not just something to be applied to workers; managers must be held accountable for safety-related decisions, too.

How do the agencies accomplish this? Vigorously evaluate performance. Have ramifications for safety violations. Hold Agency Administrators and directors accountable for their budget, policy, human resource/personnel and programmatic decisions. Continue to address competency problems. Recognize the difference between competency problems and "safety violations" and handle them differently (but handle both quickly and affirmatively). Both "the system" and individuals must hold people accountable for safety requirements.

Wildland firefighting (and emergency response in general) occurs within a context of great uncertainty. There are many hazards to consider. One never is sure when the wind will suddenly shift, or when multiple fires will occur simultaneously, or a tree limb will fall. Fire behavior and fireline safety result from the interaction of many conditions and events. Outcomes of individual and collective actions then, are not evaluated against a single initial objective. They are evaluated against less precise criteria, such as how well individuals, crews, and teams expect the unexpected and prepare for the unanticipated.

The major cultural change needed is to foster a fireline safety culture that has situational awareness and risk management at its core. What does that look like? In the desired culture people maintain constant, updated awareness of their working environment; collect and synthesize information as a team, *and* rely on strong leadership to recognize danger, make decisions that are "primed' by their situational awareness, and mitigate risks rather than "working through them" or ignoring them.

At the operations level, people need to step forward and recognize their own accountability for actions, whether accidents, near misses, or successes. Increased self-awareness and reporting of observed safety problems make safety learning possible.

At the management level, the accountability issue is slightly different. The management perspective focuses on performance of people as teams, as staff, in the aggregate. The willingness to review performance for outcomes must be demonstrable. They must look at accidents, near misses, and successes, and analyze why they happened. Then management must be willing to publicly recognize, correct, share, or (for successes) encourage what they uncovered.

Accountability in the sense it is described here cannot be delegated. The intent of taking such a perspective is to get all the players – workers concerned with outcomes from individual behaviors, and managers concerned with outcomes from collective behaviors – into a context of objective accountability.

As you finish this summary and read the report, review the various topics and recommendations through a filter of the principles discussed above. Consider each of the issues in terms of your place in the change process, in terms of your leadership role, whatever your position, and in terms of how you personally can practice accountability.

Highlights of Recommendations

The most important ideas for changing the wildland firefighting culture in the United States in a way that would improve safety may be grouped into the following categories: leadership (including risk management), retention of experience, improved training and certification, human communications, human factors, professionalism and attitudes about safety, safety incident reporting, and external factors (especially prevention). For each category we identified a major principle or "pillar of wisdom," a set of goals, and specific recommendations for implementation.

The description of recommendations here and in the body of the report is necessarily sequential, though many of the recommendations would be implemented in parallel and are highly interrelated.[3] As mentioned earlier, the full list of recommended

[3] An attempt to diagram the complex interrelationships of the many areas needing improvement was provided in the Phase II report.

implementation strategies, with priority rankings, is at the end of this summary. Virtually every strategy will be a continuing process, not a unique, one-shot project.

The selection of priorities and development of an action plan to implement the recommendations here is the prerogative of the five agencies. We indicate below with asterisks the actions that our project team would start with by the next fire season. All of the following recommendations are important; it is less critical which to address first than to address all over the next few years.

Strengthen Leadership

Leadership of crews, divisions, Incident Management Teams and other resources is possibly the most critical factor in safety. Many people in leadership positions have not been trained in leadership skills and human relations, as opposed to the technical side of their jobs, and some are poorly suited to lead or supervise. There are some critical improvements needed in leadership selection and training to enhance safety.

Principle #1 – Assure that people in leadership positions are qualified.

- ***Screen potential leaders*** – Some people should not be or cannot be firefighters or fire leaders. If they do not have both the competence and suitability they need to be weeded out if they cannot be trained. There was a surprisingly strong call from all position levels surveyed in Phase I for screening potential supervisors and existing supervisors up for promotion as to their leadership ability as well as technical knowledge. This is widely done in the local career fire service using interviews, in-box exercises, multi-perspective assessments and psychological tests. Screening should be done at every level of supervisory positions.

- ***Require stronger fire qualifications for FMOs and other managers*** – Agencies must not assign employees to key fire management positions if they do not meet interagency and agency-specific competencies and qualifications. Training to competency while holding the job is not safe, and should not be permitted. We recommend development of minimum fire qualifications and competencies for people assigned to be Fire Management Officers (and equivalent positions). There

are several tiers of FMO positions and it is a critical position at every level. The FMOs have duties that affect employee and public safety. They help plan the fire program and often have line or advisory roles at fires.[4] Fire management courses also should be required for all fire management officials; specific courses are recommended in the text.[5]

- ***Train all Agency Administrators in fire management basics*** – Agency Administrators do not need to be expert in firefighting but must have some minimum knowledge and competencies in fire management – how it works, where the dangers are, the basics of strategy and tactics. There has been considerable progress in raising their awareness about fire management issues through the improved Agency Administrator courses taught at the National Advanced Resource Training Center at Marana, Arizona, and at the geographic area level. The courses should continue to be improved and should be given to all Agency Administrators because of their influence on strategy and budget allocation decisions, and hence on safety. Agency Administrators must understand where their desire to protect resources could lead to asking firefighters to do something that is not safe with the available resources.

- ***Train for decision-making under stress*** – Leaders must be explicitly trained to operate under a variety of stresses, such as noise, heat, time demands, potential for failure, and outside pressures. There are many proven techniques for conducting this training. Appendix C presents a package of techniques called "Decision Skills Training." It includes a decision requirements exercise, tactical decision games, decision critiques, "pre-mortem" exercises, uncertainty management, situational awareness calibration, and a "commander's intent" communication exercise. The good news is that training people under one type of stress tends to carry over to operating under other kinds of stresses.

---

[4] These changes for FMO positions and equivalents are already planned for implementation, by about June 1998.

[5] The Federal Fire and Aviation Leadership Council (FFACC) approved a revision of training requirements for fire management at various levels in February 1998, as this project phase was being completed.

- ***Increase situational awareness and prepare to handle the unexpected*** – Leaders need to be trained and encouraged not just to follow a long list of rules by rote, but to maintain situational awareness, use a risk management approach, and to be prepared to handle the unexpected. Having to deal with the unexpected should be expected. The skills to do this can be developed in part through the decision training noted above, but there also needs to be an expectation levied by managers that people will use their judgment effectively. There needs to be situational awareness at the strategic and management levels as well as at the firefighter/Crew Supervisor level. Better, well-screened information should be provided through new technology to improve situational awareness (e.g., better aerial imagery of the fire situation, better tracking of where each crew is.) Leadership training needs to make clear how a series of small oversights, errors or lack of information can build into a disaster. There are many examples, e.g. the Dude and South Canyon fires.

Principle #2 – Promote accountability for safety at all levels.

* [6]***Promote accountability through appropriate penalties and performance evaluations*** – As noted earlier, there was a very strong feeling from all ranks surveyed that those who make serious errors in judgment or disregard safety should be held accountable. Managers as well as firefighters must be held accountable. Certainly there should be "due process," when safety incidents occur, but in the meantime, individuals should be put on administrative leave or returned to a non-fire job while a casualty, entrapment, or near miss is investigated. (This is similar to what happens when a police officer discharges a weapon, or a pilot has an accident.) If a serious safety violation was committed, the accountability might include remedial training, being required to work under a "coach" on one's next assignment, being demobilized, having one's qualification level reduced, suspending or revoking one's red card, or even suspension from firefighting for a week, a season, or permanently, depending on the severity of the offense. Sending

[6] As noted above, asterisked items are those the project team felt should be implemented or at least started by the next fire season.

someone home from a fire for a safety violation and then immediately reassigning him or her to another fire should never be done. Accountability also can be promoted by routine performance measurement, using elements of the Position Task Books and people's success in managing risk as part of fireline performance evaluations.

- ***Set objectives, strategy and tactics for fires commensurate with available resources*** – Practice risk management at the highest levels. Don't pressure firefighters to make up for shortage of resources. Rather, be flexible and revise strategy and tactics to fit the available resources. Policy calls for this to be done, but it is not always observed in practice under a variety of pressures.

- ***Resist political pressures*** – Agency Administrators sometimes receive political pressure to fight fires in ways that may not be consistent with the resources available or with safety principles. The Agency Administrators must be backed by senior agency officials in resisting these pressures, and must not sacrifice safety for expediency. Agency Administrators must know their jobs are secure if they resist such pressures, and if they think safety, not politics. That can be achieved in part by having clear policy statements that they follow, and by disseminating examples of instances where resistance had positive rather than adverse consequences.

- ***Gain Agency Administrator support for changes in the culture*** – Most firefighters are willing to try to achieve goals in the face of adversity, sometimes beyond what is safe with available resources. Agency Administrators can send the wrong message by requiring an Incident Management Team to stick with an untenable strategy (e.g., ordering that a fireline must be held to protect resources, or that a particular strategy must be used that is not reasonable with the available resources). The Agency Administrators not only have to be on board the safety program, but must help remind firefighters to operate prudently and professionally, and to exercise accountability. Support from Agency Administrators is critical for implementing the recommendations here; it would be difficult to proceed with changing the culture without these key leaders lending a sense of urgency to the process.

- ***Make safety a year-round, day-in/day-out practice in the workplace*** – How one thinks and acts about safety on one's non-fire job and one's life outside of firefighting may well influence attitudes during firefighting (and vice versa). For people who fight fires as collateral duty as well as for dedicated full-time firefighters, leadership should give attention to safety on-the-job year-round, adhere to OSHA regulations, and promote safety in other ways, day in and day out, not just in an emergency.

Retain Experienced Personnel

A major negative factor in the wildland firefighting culture has been the loss of much firefighting experience through retirements, employee cutbacks across all disciplines, loss of motivation, and disincentives to continue in fire duty, especially in supervisory and management team positions. Collateral duty firefighters who return to a desk overflowing with backed up work are less willing to repeat the experience. The reduced numbers of experienced firefighters and fire managers has led to assigning some people two or three jobs, substituting with unqualified people, or leaving some tasks undone. Experience relates to safety in many ways, most directly through providing a wealth of knowledge and expertise for making decisions in the field under stress, being able to deal with uncertainty, and recognizing when events don't follow expected patterns.

Principle #3– Rebuild the level of firefighting and fire management experience.

- ***Improve retention incentives and reduce disincentives*** – The overall societal culture has changed. Working for what is perceived as unfair pay is no longer accepted. Retention of experienced firefighters (especially Crew Supervisors) and those in decision-making fire management positions must be encouraged, with appropriate pay incentives and promotion possibilities; giving them adequate recognition (e.g., certificates, pats on the back, feature articles, their pictures in the media); removing disincentives (e.g., pressures from their home supervisor); and treating firefighters as professionals. People in key positions (e.g., FMOs) should be dissuaded from becoming "early outs".

- ***Tap the unused experienced talent pool*** – Some experienced fire management talent has been lost because people stopped wanting to be involved in the fire program. Get some of this talent back into play by restoring the idea that fire is an agency mission, not just the fire program's mission. Virtually everyone can contribute somehow.

- ***Develop a strategic human resources plan and fill the pipeline with new talent*** – The pipeline of people in development for higher positions needs to be kept filled with apprenticeship programs and other means to replace the experience being lost. To do this there must be a human resource plan with long-term and short-term goals. The number of qualified, experienced people available for each position needs to be tracked. There needs to be a nested system of staffing targets for various units and geographic areas/regions that are coordinated in an interagency national plan.

Improve Training

Another major strategy for filling the experience gap is to improve the realism and field-relevancy of training through a variety of training approaches: on-the-job training, simulations, field exercises, and more visual, more hands-on training.

This study also identified a wide variety of problems in the existing training programs, as good as they are. In part, the problems are omissions: lack of adequate training for seasonals, lack of training in human relations skills and leadership; and lack of adequate decision training. There also are quality control problems, especially the variation in quality and training of instructors.

Principle #4: Realistic, high quality training must be used to compensate for lack of experience. Proper training also is critical for safety by teaching safe practices and developing proper attitudes.

* ***Foster on-the-job training*** – A critical, required change in the culture is to foster mentoring of younger firefighters and Incident Management Team members by the more experienced members. This can be done by teaching the mentors how best to

do on-the-job training (OJT), and adjusting how work is done to provide the opportunity to deliver OJT. Recent research has proven that mentors can be trained to improve their delivery of on-the-job training. There is a set of about 50 skills to significantly speed up the process of transferring knowledge. For example, rather than telling the crew members what to do, a Crew Supervisor experienced in OJT finds the "teachable moment" to ask the crew how they would do it, then discusses the chosen rationale (when there is time to do so, of course). This mini-drill often can be done quickly, and speeds the overall learning process. It also presents an opportunity for someone on the crew to point out to the Crew Supervisor a dangerous situation that might not have been realized by the supervisor. OJT can be used at every level in the organization. Appendix B amplifies the discussion in the body of the report on implementation of an OJT program.

- ***Make training more realistic*** – Realistic training can in part substitute for experience. In some cases it can provide knowledge through simulated experience that is not possible in the real world (just as a flight simulator can train pilots for violent maneuvers). Realistic training may involve virtual reality using sophisticated computer simulations, but training realism can also be increased by lower level computer simulations, by taking some training outside, and by appropriate paper and pencil exercises conducted under stress in real time (all of which are already being done to some extent.) Among the most critical areas needing more realistic training are size-up, situation awareness, decision making, and management of risk exposure. Deployment of fire shelters also needs to be taught under realistic conditions (wind, rough terrain); it is being done by some but not all trainers.

- ***Provide more refresher training, especially for seasonals*** – Although policy requires that annual refreshers be given, budgetary pressures and other tasks often cause the "season" for seasonal firefighters to be shortened at the front end, which may eliminate part or all of their fire training. Mandatory non-fire training also reduces time for fire training for various personnel. It is critical to refresh all crews with safety information at the beginning of each season, and at other opportunities. To make refresher training most effective requires analysis of the most important skills or procedures that get forgotten the most from season to

season, and then targeting the training to these greatest needs. Priority should be given to training those most likely to be on the fire line (including managers and supervisors). More broadly, there is a need for refresher training to be conducted for all operational personnel. This can be done with a combination of on-the-job training and mini-training sessions.

* ***Use more case studies, interactive exercises, and visual materials; critique actions and disseminate "lessons learned"*** – A better job is needed in undertaking reviews and debriefings after action. Most importantly, a place needs to be established to send good, positive lessons and then disseminate them. The U.S. Army has developed a "Center for Lessons Learned" that collects case studies, screens and digests them, and quickly disseminates key lessons and edited case studies. Harvard Business School professors think it is a superior and transferable approach to ensure that both positive and negative lessons learned from field experience and training exercises get saved, processed, and promptly disseminated to the field. It is credited with providing feedback to make a first-rate organization even better, and not rest on its laurels as times change. Appendix A discusses how to establish a Safety Center for Lessons Learned that can be a source of case studies and other realistic training materials.

* ***Use a newsletter and other means to spread positive and negative lessons*** – Storytelling is an intrinsic part of the wildland firefighter culture. Advantage should be taken of that in promoting success stories as well as examples of failures. The "story" of the tragedy at Storm King Mountain in which 14 wildland firefighters lost their lives helped stimulate a great deal of positive safety behavior.

  In aviation safety circles, there are brief newsletters that circulate to all levels of the organization, and provide anecdotes about safety issues, humorous stories, and good lessons from operations or simulations. Something similar is needed for the wildland firefighter, especially during the fire season to reach the maximum numbers. The newsletter can be developed by an editor using desktop publishing software, which makes it inexpensive to do. This newsletter might be a product of the proposed Center for Lessons Learned, or an offshoot of existing publications.

Its dissemination must be very wide at the firefighter level.[7] Dissemination can be by a variety of means, including distribution directly to camps and incident bases and by Internet.

Selected stories (case studies on lessons learned) need to spread verbally as well as by newsletter, as part of on-the-job training and informality, since some firefighters will not have access to newsletters or may not read them.

One of the key tasks of the stories is to make the inconceivable conceivable. It is hard for people to imagine that there can be a series of small steps, or a confluence of unfortunate events, that will lead to an entrapment or a fatality, yet those situations occurred repeatedly in the past.

Ensure Adequacy of Certifications and Qualifications

The red card qualification system must have integrity and must be an inviolate symbol of the culture. Between grandfathering-in some people not qualified, and signing off on others whose experience is not adequate, the red-card has deteriorated as the symbol of competence and integrity. There also is wide concern about the qualifications of a small fraction of leaders and fire managers who do not have adequate fire background and who can profoundly affect safety; this was addressed under leadership training.

Principle #5 – Ensure the integrity of the red card qualifications system.

- ***Enforce the requirements of the certification system*** – The present red card system can work if properly enforced and if the requirements at each level are properly interpreted. Improperly signing off on a red-card qualification, or

[7] Emergency Firefighters (EFFs), a special hiring category, will be more difficult to reach for this approach and a number of other recommendations in this report. Special attention needs to be given to how the various ideas here can be adapted to the needs of the EFFs, who comprise a significant portion of the basic firefighter workforce.

falsely representing your qualifications or those of the people you supervise must be a grave offense with serious consequences.

Improve the Human Side of Communications

Communications are critical to safety. A common finding in firefighter fatality and serious injury incidents is a failure to provide adequate warnings, or lack of clarity about desired operations. One of the most important changes needed in the culture is to promote two-way communications – a dialogue – rather than one-way communication in which information is sent down the line or requests sent up the line, with no guarantee they "get through," let alone are understood.

Principle #6 – Communications must be clear and understood.

* ***Use acknowledgments to close the loop*** – Whenever information is transmitted, especially by radio but also face-to-face, there should be an acknowledgment with varying amounts of feedback from the receiver to the sender. Both have responsibility to see that the loop is closed, with understanding. The basic idea is to follow a crew resource management (CRM)-like approach and related concepts in aviation communications, where, for example, changes in altitude directed from control tower to pilot are confirmed by the pilot, and where crew member-to-pilot, or pilot-to-crew member instructions get repeated.

For firefighting, acknowledgments can run from:

- Simply saying "Copied" to respond to a straightforward, non-safety related piece of information, to
- Repeating key elements of a message (such as saying, "Understood, dig line from the creek east"), to
- Repeating part of a complex instruction ("We are to continue digging line unless the wind shifts in our direction, and if that happens, will immediately retreat on the escape route to the east.")

A command and control organization tends to encourage "telling people" or "giving orders," with the assumption that the receiver understands. The key change recommended is to require confirmation of what is understood. This should be done for all non-trivial messages, with confirmations being terse so as not to overload radio channels. Training courses will have to be revised to reflect this and the other changes recommended for improving communications. Examples of good communication should be given explicitly or implicitly throughout the curriculum.

* ***Legitimize and encourage asking questions*** – In addition to feedback, another key change needed in the culture is making it easier for a subordinate to ask a supervisor or colleague about what one is supposed to do, or how one is to interpret information received. The acknowledgment process discussed above will help provide opportunities for people to ask questions about an assignment if it is unclear. But going further, it must be the ***sender's*** professional responsibility to ensure that a communication that could affect safety is received and understood. It must be the ***receiver's*** professional responsibility to ask questions about a communication that was not clearly heard or understood, or if implications of what to do are unclear. Specific techniques should be taught to supervisors on how to encourage querying, especially for supervisors of crews or teams that have not been together for long. It can be as simple as the supervisor saying something like this when the crew first meets: "We haven't worked together before, but once you get to know me you'll see that I appreciate being asked questions." Giving praise for good questions also encourages queries.

- ***Legitimize pointing out safety problems (and solutions)*** – It must be not only a right but an obligation for everyone from the newest member of a crew up through incident commanders to point out safety problems to their supervisors, and to report injuries, entrapments, and near misses. It should also be a responsibility to point out safer ways to accomplish a mission where possible. (This, too, is part of the Crew Resource Management concept used in aviation.) The culture should encourage raising safety issues and solutions in a "respectful interaction," in which one raises the issues politely with one's supervisor, and, if need be, with the next level up the line. Supervisors must not be allowed to punish someone for raising a

safety issue in a proper manner. Performance ratings should consider how well supervisors promote an open environment for addressing safety issues.

* ***Improve briefings*** – The content and orderliness of briefings in the field need to be improved. Special efforts also are needed to get adequate debriefings from crews or other units going off duty, and get the information to the units on duty. Checklists of things to cover in briefings should be provided (see examples in text). Here, too, the principal of two-way communications should apply: those receiving briefings who do not understand the situation or its implications need to take the initiative to ask questions.

* ***Ensure all crews have radios*** – There must be an adequate number of radios provided to each crew and a radio for each resource such as dozers. It is critical for safety to be able to keep in touch and coordinate all units. Some crews and other units have had too few radios or even none at all.

Human Factors

Many of the desired goals here deal with human factors – psychological, mental, and physical. In addition to the human factors inherent in the issues discussed above, more attention must be given to fatigue, crew dynamics and crew cohesion, and to accurately representing crew capability levels. Crews have been misused at times from lack of awareness of their fatigue level, their lack of training or lack of equipment. (Similar concerns apply to engine crews, single resources[8], and management teams.) Safety experts also believe that the degree of crew or team cohesion makes a significant difference in team decision making, response to leadership, and their ability to react appropriately in an emergency.

Principle #7 – Individuals and crews must not be used or pushed beyond their capability.

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[8] "Single resources" are individuals such as division supervisors or dozer operators who are ordered up individually, as opposed to a crew or team, who are ordered up as unit.

* ***Prevent fatigue*** – Fatigue is a critical factor that can lead to illness directly, and to injuries through carelessness or bad decisions by people who are fatigued. It is one of the highest priorities to address. The agencies must deal directly with reducing fatigue levels. The Bureau of Indian Affairs (BIA) has found that 80 percent of injuries occur during the third week in the field; similar research should be done for all agencies, and the results communicated to all firefighters. Crews and teamwork/rest guidelines need to be revisited. The length of tours in the field should be reduced, perhaps to two weeks instead of three. Research should be undertaken on how work/rest cycles, including cumulative fatigue over a season, the number of consecutive days in the field, and the length of operational periods, affect the safety of wildland firefighters. Whatever work/rest guidelines are chosen, they must be enforced. Also, the quality of rest must be improved – reducing exposure to noise, light, heat, etc. – for people who are sleeping, especially those resting during the daytime after night operations. Lack of adequate rest should be considered at least as serious a safety problem as not having a hard hat or shelter.

- ***Accurately report fatigue, health, and equipment status*** – The condition of crews, Incident Management Teams, and single resources – including their fatigue, injury status, health, and equipment deficiencies – must be accurately and honestly communicated to whomever has to decide on their use. This is usually done but not always. It should be a grave offense for a Crew Supervisor, team leader, or single resource to misreport the condition of their unit when checking in. (Some well-publicized suspensions of violators may help make the point.) It is understandable that people want more work to earn more money, but it must not be at the expense of themselves or the people they lead. Pay systems should be revised so as not to be a factor in promoting fatigue. Candor in reporting status must also be encouraged among state and local career or volunteer firefighters who work on a Federal fire. Criteria need to be developed that describe crew status in a concise and useful way to those assigning them.

- ***Recognize differing capability among Type II crews*** – The competency as well as condition of resources must be considered in making assignments. In particular, there was a high level of concern among firefighters in every region about misuse of Type II crews. The training and experience of Type II crews vary widely. Some have equipment problems (e.g., a shortage of radios). Typing of crews must reflect performance that can be expected. It may be desirable to categorize crews using three types, as once was done, to facilitate making an appropriate assignment. Whatever categorization is used, the capability and status of a crew must be considered in giving them an assignment, because it affects their safety as well as their performance. The same holds true for assigning State and local fire agency crews, contract crews, and military crews.

Principle #8 – Unit cohesion should be fostered, and attention given to developing good crew dynamics.

- ***Explicitly build crew/team cohesion*** – Usually Type II crews (and occasionally some Incident Management Teams) are brought together for the first time at fires. Crew Supervisors, team leaders, and other managers/leaders should directly address the fact that they may be at times dealing with a group of strangers, or several clusters of people who know each other within their cluster but not the people in the other clusters. The leaders should systematically, purposefully build a team. One recommended approach is to explicitly raise this issue with the team, frankly discussing the need to get to know each other quickly. This will break down some of the communications barriers that make people reticent when they don't know other people in a group. Also helpful is to quickly establish a specific, identifiable role for each person on the crew, or squad, such as is done on Hotshot crews. New Incident Management Team members already have an identity by virtue of their specific, named position (e.g., finance section chief, operations section chief), but they, too, need explicit direction to quickly establish contact with those with whom they most interact. Beyond the very first meeting, there are many ways to promote team cohesion, and not just wait for time to solve the problem (as discussed in Chapter 5).

Promoting Safety as Part of Professionalism

It is difficult to promote safety directly without the effort sounding like "sloganeering" or lip service. A successful approach used in other dangerous occupations such as urban firefighting, race car driving, and aviation is to make the very concept of being a professional include being properly equipped with safety gear and exhibiting certain safety-related behaviors. The agencies need to define a core professional ethic – the behaviors that define professional conduct for all Federal wildland firefighters, regardless of whether they are full-time, seasonal, collateral duty, or EFF. They also need to expand the professional corps of firefighters around which to improve the program, and to improve the professionalism of collateral duty employees (the "militia"). The central corps of firefighters in Type I crews should set the example for the others by "doing it smart."

There is another link between the concept of professionalism and safety: recognizing firefighters as professionals contributes to their feeling appreciated, and will help in retention, which in turn builds experience and thereby increases safety.

Principle #9 – Develop an attitude and ethic of professionalism that encourages retention and promotes safety behaviors.

- ***Depict safety as the skill exercised by professionals*** – People engaged in firefighting or Incident Management Teams should be considered as professional firefighters in the field, regardless of their job title. Make safe behavior, taking precautions, wearing the proper protective clothing, using tools safely, maintaining situational awareness and communicating safety problems all part of what it means to be considered a professional. Professionals are obliged to report injuries and near-misses, point out safety problems, and suggest safer approaches. The idea is to change the culture to incorporate safe behavior as part of the essence of being professional – you can't get the job done if you get hurt.

  Firefighting must be viewed both by the agencies and by firefighters as a profession requiring skill, and fortitude, not just guts and risk taking. The Federal firefighters

of the future shall be proud that they made a smart assessment of their situation and that their assessment drove decisions along the way to success.

To help change the culture, spread stories that illustrate skill and risk management. Tell stories about real incidents to help people picture the inconceivable. Illustrate how a series of small, incremental problems can accumulate to a disaster. Reward ideas that contribute to safety without denigrating courage.

Two or three decades ago, urban firefighters were considered macho and professional if they went into burning buildings to rescue people without using breathing apparatus and wearing protective clothing. Today they would be considered foolish and unprofessional, unable to do their job effectively unless properly attired and equipped. Similarly, wildland firefighters need to have certain equipment and practice certain skills to be considered a professional. This theme needs to be included in training and all aspects of the culture.

Safety Incident Reporting

Adequate information on the causes of safety incidents is critical for targeting safety and measuring progress. It must be collected and widely disseminated. However, there does not yet exist reliable, comprehensive data on wildland firefighter injuries, near-misses, entrapments and shelter deployments. The number of fatalities is accurately reported, but investigations of them are not done consistently, nor are the underlying factors for safety incidents always identified. There is no consistency in reporting across all agencies.

Principle #10 – Collect reliable safety data, and use it to target, prioritize, and evaluate programs.

* ***Develop a comprehensive, multi-agency injury/near-miss reporting system –*** All injuries, entrapments, near misses and safety problems must be reported. It is almost inconceivable that a comprehensive data collection system is not yet available for accident, injury, or near-miss events across the agencies. There have been many false starts, and nothing brought to fruition. Definitions, reporting forms, and a system for collecting and analyzing injury data and near-

miss data need to be implemented consistently across all agencies. The resulting data must be analyzed and the results fed back into the appropriate training courses, on-the-job awareness, and elsewhere. An important component of the reporting system must be the ability for anonymous reporting of specific incidents, safety problems and information on near misses, as is done in aviation. We recommend that a new safety incident reporting system be one of the first tasks worked on, because it is critical for targeting and evaluating many of the other recommended strategies for improving safety. The data system should routinely publish summary reports of the findings, at least annually. The data system should also be a source for special reports on safety issues.

- ***Standardized interagency investigations*** – The investigation protocol for the more serious incidents needs to be standardized, and more importantly, broadened to capture key information needed for improvement of safety – especially the human factors. A draft protocol now exists. The investigations must include interviews of various people who were at the scene as to what took place and how the problem could have been avoided. Why the incident occurred needs to be explored as well as what happened. Lessons need to be drawn for the future, and the results disseminated through the newsletter mentioned earlier and/or by other means. The National Institute of Occupational Safety and Health in 1998 was given new responsibility and funding for investigating all types of firefighter fatalities, and there needs to be agreement on how the various agencies will coordinate undertaking fatality investigations.

External Factors

The safety of firefighters is affected by many factors beyond their control. On the Phase I survey more firefighters identified reducing the accumulated fuels in wildlands as high priority for improving their safety than any other factor. Accumulated fuels increase fire severity and complexity.

A second key external factor is the degree to which property owners safeguard their property. That affects fire incidence and the strategies needed for urban interface

fires, and thus can affect firefighter safety. A third external factor was inadequate fire program budgets, which reduce the level of resources available to fight fires, and increased pressures to do more with less.

Principle #11 – Promote prevention and fuel treatment programs for their impact on firefighter safety as well as for their land management results.

- ***Implement expanded fuel treatment and public education programs*** – The wildland firefighting culture must continue to promote and expand fuel treatment programs (both prescribed fire and mechanical approaches.) It must also increase public fire safety education. Both programs help prevent and mitigate the severity of wildland fires. They not only reduce losses, but also help prevent firefighter casualties. Wildland firefighters themselves need to be educated on the merits of fuel treatment and public education, and armed with arguments to help others understand the importance of these programs. Prevention programs are especially important for mitigating interface fires.

  The public must be educated not only on what they can do to mitigate losses, but also on the limitation of firefighters – and specifically that firefighters cannot be expected to sacrifice their own safety to protect homes in environments that are virtually indefensible if they lack certain design and landscaping features. A new, intense national public education program is needed to get these messages across. This might include taking more advantage of the "teachable moments" during large, nationally publicized fires.

Starting Actions on Implementation

To change the wildland firefighting culture will require more than an edict that comes out saying, "Do all this stuff." The driving moral force for these recommendations comes from the 1,000 firefighters who participated in Phase I, from numerous meetings with various safety and mid-management working teams and knowing that we can do better. The operational levels of the workforce – the firefighters, Crew Supervisors, Floss, District Rangers, and others – must be kept involved in the implementation process.

However, the senior fire management officials and Agency Administrators must be the ones to get the changes started.

The first step needed to move forward is for the five agency fire directors or their designees to develop an assignment matrix, with milestones and an individual or unit responsible for each implementation strategy. The report and implementation plan need widespread dissemination. Specific steps for moving forward with implementation are recommended in Chapter 7.

The fire directors, their immediate subordinates, and others on down the chain of leadership also must practice a series of small, incremental actions that demonstrate they care about safety, and that help guide the changes. This includes asking questions about safety implications of various programs as they are discussed, giving praise for steps taken in the right direction, spreading examples of serious problems or innovative solutions to problems, correcting memos, reports, and policies that further the status quo, pointing out changes in the way information is acknowledged, seeing that the needed training takes place, and doing their own on-the-job training with subordinates. In other words, show in a variety of ways that the multi-agency wildland firefighting establishment means business about changing the culture. As one firefighter who reviewed this report put it, "Higher level folks need to … show by where their feet take them what is truly important."

Each reader of this report and the rank and file firefighters shoulder responsibility to change the culture of safety in wildland firefighting. Each person must consider the recommendations, and their own part in the change process, leadership, and accountability for actions taken.

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The following table lists all of the goals and recommended implementation strategies. They are grouped under the relevant safety principle they addressed (18 principles in all, including three not discussed above.) Each goal and implementation strategy is discussed in the body of the report. Some goals apply to more than one principle, and some implementation strategies to more than one goal, but to avoid redundancy each is listed only once here; the text provides cross-referencing.

TABLE 1-1. SUMMARY OF PRINCIPLES, GOALS AND THEIR PRIORITY RATINGS AND IMPLEMENTATION STRATEGIES

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
ORGANIZATIONAL CULTURE		
Principle – Preserve strength of current system.		
Goal 1. The existing strengths of the Federal wildland firefighting system should be preserved and built upon.	*2*	
IS 1 – "Physician Do No Harm." Evaluate proposed strategies and changes to avoid unintentional negative side effects.		2
IS 2 – Disseminate information on what is perceived to work well.		2
IS 3 – Fix the existing system first.		3
Principle – Collect reliable safety data and use it.		
Goal 2. A "Code of Conduct" should be established in which employees should have both the right and obligation to report safety problems, and to contribute ideas on their safety to supervisors. The supervisors are expected to give the concerns and ideas serious consideration.	*1*	
IS 1 – Disseminate directives – and otherwise spread the word – that each person is expected to report safety problems and to contribute potential solutions.		1
IS 2 – Train new firefighters to speak up about safety.		1
IS 3 – Train supervisors to listen.		2
IS 4 – Include the raising and handling of safety comments in performance ratings and accountability systems.		2
IS 5 – Involve employees in developing ways to get these ideas implemented in the field.		1
IS 6 – Promote a single code of conduct (including the reporting of safety incidents) across agencies.		2
Goal 3. Every employee is expected to report a) injuries (and of course fatalities), b) entrapments/shelter deployments/burnovers, and c) near misses.	*1*	
IS 1– Develop a common interagency reporting system.		1
IS 2 – Incorporate basics on safety reporting in training courses.		2

[1] Priority ratings are given in terms of the importance for change from the current situation, not the absolute importance of the goal or strategy. The ratings are: 1 – Critical to change or improve, 2 – Highly important to change or improve, 3 – Important or desirable to change or improve. Some very important subjects (e.g. transport of injured firefighters, or the need to be sober) were given lower than "1" ratings because of having less of a need to change from where they stand today than was the case for other issues.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 4. The five agencies should strive to obtain a clear, quantitative picture of the pattern of safety incidents, their causes, trends, and the lessons learned; and to identify potential problems at the earliest time possible.	*1*	
IS 1 – Analyze and publish safety data.		1
IS 2 – Establish a safety-oriented Center for Lessons Learned.		1
Goal 5. All wildland firefighter fatalities should be investigated in a consistent manner to glean lessons for averting future fatalities.	*1*	
IS 1 – Develop interagency protocols for the process and substance of investigations.		2
Principle: Promote accountability for safety at all levels		
Goal 6. Individuals at all levels should be held accountable for safety violations.	*1*	
IS 1 – Start policy of removing safety violators from the job.		1
IS 2 – Follow-up on reported safety infractions.		2
IS 3 – Consider safety performance in performance reviews and promotions.		1
IS 4 – Add training in accountability.		2
IS 5 – Include accountability in operational guidelines.		2
IS 6 – Provide guidelines for accountability.		2
Goal 7. An individual or Crew Supervisor should have the right of refusal to pull themselves or their crew out of what they perceive as undue danger.	*2*	
IS 1 – Train firefighters on the process to use, not just the right.		1
IS 2 – Monitor frequency of refusals.		3
IS 3 – Head off situations in which refusals are necessary.		1
Goal 8. Foster a sense of individual responsibility for safety actions.	*2*	
IS 1 – Include in the 'code of conduct' that all employees are responsible for adhering to safe practices and correcting violations.		1
IS 2 – Discuss the issue of responsibility in initial training and in refresher training.		2
IS 3 – Disseminate examples and stories of successful individual initiatives.		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Principle – Promote safety for all who work at Federal fires		
Goal 9. The safety goals and rules should apply to all firefighters working at a wildland fire which is a Federal worksite.	*1*	
IS 1 – Require, encourage, and assist non-Federal agencies to comply with safety precautions.		1
IS 2 – Provide (or facilitate obtaining) training and equipment for non-Federal firefighters who assist.		3
Goal 10. The rights and responsibilities of wildland firefighters should apply to all, regardless of race, gender, ethnic affiliation, or employment status.	*1*	
IS 1 – Ensure that all of the recommendations here are applied uniformly for all types of firefighters.		1
IS 2 – Ensure equitable equipping and treatment of Type II crews.		
IS 3 – Provide opportunities for verbal communications training.		3
Principle – Rebuild the level of experience.		
Goal 11. Adequate experience levels are needed for Crew Supervisors and higher positions. There is a minimum cadre of experienced personnel needed for each supervisory level of the fire program.	*1*	
IS 1 – Periodically develop strategic assessments of personnel needs.		1
IS 2 – Track experience levels.		2
IS 3 – Establish an apprenticeship program.		2
IS 4 – Revise requirement for currency of certification.		2
IS 5 – Increase the use of special assignments to build experience.		3
IS 6 – Encourage more participation from non-fire personnel.		3
Goal 12. Encourage the retention of permanent employees on fire duty.	*2*	
IS 1 – Remove pay caps for overtime on fires.		2
IS 2 – Consider expanding use of special pay and retirement incentives for collateral duty personnel.		3
IS 3 – Increase expectations for employee participation in fire programs.		2
IS 4 – Evaluate employees' willingness to participate in fire programs.		2
Goal 13. Encourage retention of seasonals on fire duty.	*1*	
IS 1 – Re-examine personnel policies that inhibit retention of seasonals.		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 14. Develop ways to use training of various types to compensate for lack of experience.	***1***	
IS 1 – Expand use of on-the-job training; train people how to do it.		1
IS 2 – Enhance course training in strategy and tactics.		1
IS 3 – Develop family of simulators and other instructional technology.		2
IS 4 – Develop a family of simulations.		2
IS 5 – Use more visual, interactive multimedia training.		2
IS 6 – Prepare for out-of-region experience.		3
Goal 15. Ensure that individuals and crews in low fire incidence areas have the opportunities for experience in other areas, and/or have adequate oversight when sent to different or complex situations.	***3***	
IS 1 – Provide opportunities to work in high incidence areas.		3
Principle – Ensure the integrity of the certification and qualification system.		
Goal 16. Certifications (e.g., Red Cards) should be meaningful indications that a person is ready to take on the requirements of the job they are certified for.	***1***	
IS 1 – Better explain the intent of the system and its requirements.		1
IS 2 – Train managers better on implementing performance – based certification.		2
IS 3 – Revise Position Task Books if necessary.		2
IS 4 – Use key tasks from the Position Task Books in performance evaluations.		2
IS 5 – Toughen currency requirements.		2
IS 6 – Make training required (versus "suggested") to achieve qualifications.		2
Goal 17. Signing off on Red Card credentials without reasonable evidence that the person has met all of the requirements should be a punishable offense.	***2***	
IS 1 – Educate and build confidence about the system.		2
IS 2 – Utilize disciplinary actions when appropriate.		1

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 18. Credentials should be reviewed for all resources before the resources are utilized.		
IS 1 – Revise ICS training materials regarding check-in.		2
IS 2 – Motivate the check-in recorders concerning the importance of their role.		2
IS 3 – Develop "smart" Red Cards that allow quicker, more accurate check-in of individuals.		2
IS 4 – Ensure that IMT training stresses the need to consider and share information on the status and certification of crews at check-in.		3
IS 5 – Ensure equality of review across positions.		3
IS 6 – Evaluate acceptance level for insignia.		3
Principle – Communications must be clear and understood.		
Goal 19. One-way communication should be replaced by two-way dialog. People at each level of the fire hierarchy should be comfortable with requesting clarification of information, or requesting additional information. There should be no stigma attached to requesting clarification; it should be considered professional to do so.	*1*	
IS 1 – Start training in interpersonal communications with the very first firefighting training, and expand the training to include the new concepts presented here.		
IS 2 – Require formal acknowledgments, especially in radio communication.		1
IS 3 – Legitimize and encourage the asking of questions.		1
IS 4 – Use multiple means to convey the cultural change.		2
IS 5 – Establish communications protocols for tactical operations.		2
IS 6 – Use Crew Resource Management (CRM)-like training.		1
IS 7 – Change the dialogue on the fireline through on-the-job training and examples provided by supervision.		1
IS 8 – Provide instruction on use of radios and radio discipline.		1
Goal 20. Information needed for safe operations and warnings should be transmitted up, down, and laterally within the organization at an incident, (with positive feedback that the information is received and understood, as discussed in Goal 19.)	*1*	
IS 1 – Improve the quality of briefings at incidents.		1
IS 4 – Develop and use checklists for transmission of information.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 21. Dispatchers are key nodes in the communication system and must be well-trained, well-informed during the incident, and must not exceed their authority.	*2*	
IS 1 – Train dispatchers in the new approach to communications dialogue and in their role as change agents.		2
IS 2 – Improve recruiting and initial training of dispatchers.		3
Principle – Provide firefighters with safe and adequate protective gear, tools, equipment and transportation.		
Goal 22. All firefighters (on Federal fires) must be equipped with the personal protective equipment needed for their job (and the training to use it).	*1*	
IS 1 – Broadcast and enforce minimum standard for radios and personal protective equipment.		1
IS 2 – Prepare for equipping non-Federal firefighters at incidents.		2
IS 3 – Support funding for state and local fire units.		3
IS 4 – Reinforce policy on carrying shelters.		2
Goal 23. Every crew should have a continuous communications link to incident management and to nearby crews; this means having at least two radios in good working condition per crew.	*1*	
IS 1 – Improve distribution of radios, batteries, and other communication equipment.		1
IS 2 – Establish new caches if necessary.		3
IS 3 – Mandate radios for each squad.		1
IS 4 – Assure adequacy of radios for mobile resources.		1
Goal 24. The communications system used at fires needs to provide adequate channels, adequate clarity, and adequate reliability for communicating with all fire personnel, aircraft, and IMTs.	*2*	
IS 1 – Periodically re-evaluate and improve communication channel capacity and reliability.		2
IS 2 – Move some of the communications load off the radio.		3
Goal 25. There should be accountability for keeping equipment well-maintained.	*3*	
IS 1 – Describe equipment maintenance responsibility in basic courses.		3
IS 2 – Review and revise if necessary the qualifications of equipment specialists.		3
IS 3 – Hold users and cache operators responsible.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 26. Situational awareness should be improved by improving the ability of Crew Supervisors, Incident Management Team, Incident Commanders and above to obtain overhead views of the fire, including data from infrared and possibly other sensors.	*1*	
IS 1 – Use satellite imagery.		2
IS 2 – Use real time air-to-ground and ground-to-air video.		1
IS 3 – Use aerial drones.		2
Goal 27. Crews, teams, and individuals should be transported where needed with attention to net risk reduction and with consideration of reducing fatigue.	*1*	
IS 1 – Give more weight to risk reduction, especially reduction of fatigue.		1
IS 2 – Explore use of safer ground transportation.		2
IS 3 – Use computerized transportation scheduling.		3
Goal 28. All transportation drivers should have adequate experience and training.	*2*	
IS 1 – Increase requirements and realism for training of bus drivers and other drivers.		2
IS 2 – Hold drivers accountable.		2
Principle – Provide quick, high quality care for the injured.		
Goal 29. Injured firefighters should be speedily rescued.	*2*[*]	
IS 1 – Appoint a task group to review evacuation procedures and associated paperwork, and consider a model evacuation plan.		3
IS 2 – Reduce evacuation needs by improving on-site care.		2

[*] To repeat a previous note: this is a highly important goal but not rated "1" because it is largely being done and in less need of improvement than other goals.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
LEADERSHIP AND FIRE MANAGEMENT*		
Principle – Assure leadership is qualified and well-trained.		
Goal 30. Set firefighting goals commensurate with available resources.	*1*	
IS 1 – Use the "Wildland Fire Situation Analysis" approach or others to evaluate fire control strategies and select the best commensurate with available resources.		2
IS 2 – Encourage regional and national fire managers to be more flexible and to revise priorities in real time during a season, when necessary.		1
IS 3 – Provide adequate fire management training to Agency Administrators, and encourage them to exercise more discretion to enhance safety.		1
Goal 31. Do not fight fires in a way that will endanger firefighters, regardless of the values to be protected.	*1*	
IS 1 – Ensure that this goal is emphasized in strategic and tactical fire courses.		2
IS 2 – Do not allow constraints on firefighting approach due to ecological considerations to interfere with safe protocols.		1
IS 3 – Do not permit structural firefighting by firefighters not trained for it.		2
Goal 32. The strategy and tactics of fighting a fire must be flexible and periodically reconsider the available resources and the changing situation.	*1*	
IS 1 – Train and evaluate fire managers in being flexible and readjusting strategy and tactics as needed.		2
Goal 33. Long-term fire growth assessment models should be used in making decisions on fire management strategy.	*2*	
IS 1 – Prepare ahead of time for use of models.		2
IS 2 – Use fire growth models in real time to establish priorities.		3
Goal 34. Define adequacy of safety zones by terrain type, fuel type, and fuel condition.	*2*	
IS 1 – Publish a "job aid" (concise notes) on sizing safety zones.		2

* Also related are goals on situational awareness.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 35. Assure that safety is adequately considered as transitions are made from initial attack to extended attack, from extended attack to Type II IMT, from Type II to Type I IMT, and back from IMT to local unit.	*1*	
IS 1 – Emphasize the safety aspects of handling transitions in various command courses.		1
IS 2 – Develop checklists for each of four levels of transition.		2
Goal 36. Where appropriate, in areas designated for aggressive attack, more fires should have a rapid initial response when they are small, if resources are available (and when the potential for spread and the values to be protected are a concern).	*2*	
IS 1 – Get employee buy-in at all levels for use of more vigorous initial and extended attack.		2
Goal 37. To prevent information overload and allow flexibility, the fire orders should periodically be screened to identify the minimum essential set, and that should be rigorously enforced.	*2*	
IS 1 – Conduct a content analysis of the various guidelines and produce a reduced set.		2
IS 2 – Re-define which are truly orders and which are guidelines that can be modified under special circumstances.		2
Goal 38. Fire safety practices should be driven by a systematic risk assessment that gets updated periodically.	*1*	
IS 1 – Adopt a comprehensive risk management approach to firefighter safety.		1
IS 2 – Establish and cultivate a culture that encourages people to think, make effective decisions, and place a priority on firefighter safety.		1
IS 3 – Incorporate the risk management concept in training.		1
Goal 39. The list of Watch Outs needs to be integrated into training and decision-making, and their role as warnings emphasized.	3	
IS 1 – Clarify the use of the Watch Outs in training.		3
Goal 40. Workable spans of control should not be exceeded at any level of management, especially not by Division and Group Supervisors.	2	
IS 1 – Encourage flexibility in establishing and subdividing divisions when appropriate.		2
IS 2 – Reaffirm ideal span of control.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 41. Develop and use criteria for determining when night operations would be safe and effective. Acknowledge that, depending on circumstances, night operations are a tool that may enhance safety or may increase risk.	*2*	
IS 1 – Develop a job aid or set of criteria for deciding when to use night operations, and when not to.		2
Goal 42. Fire experience and competency should be considered as critical selection factors for fire leadership and fire management positions.	*1*	
Goal 43. All personnel in a given position must meet the performance requirements of that position.	*2*	
Goal 44. Fire management officers (FMOs) must be selected from among those with fire backgrounds.	*1*	
IS 1 – Set and enforce minimum requirements for key leadership positions.		1
IS 2 – Require fire experience for the FMO position.		1
IS 3 – Review incumbents who do not measure up, and reassign or retrain if appropriate.		2
IS 4 – Require Fire Management course for FMOs or their equivalent.		2
IS 5 – Give fire management training to all Agency Administrators with fire program responsibilities.		2
Goal 45. Those in sensitive command functions should have relatively fresh or updated experience.	*2*	
IS 1 – Require more recent experience (or equivalent training exercise).		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 46. Crew Supervisors should be selected not only for technical knowledge and experience, but also for their leadership skills, interpersonal communications, and ability to conduct on-the-job training.	*2*	
IS 1 – Develop a "multi-source assessment" center approach to selecting supervisors.		2
IS 2 – Stiffen other requirements for Crew Supervisor.		3
IS 3 – Train supervisors and/or candidates for supervision on how to conduct on-the-job training.		2
Goal 47. No one should be allowed to set fire strategy or tactics for a fire or give any operational orders without having adequate fire experience, or training considered reasonably equivalent.	*2*	
Goal 48. Agency Administrators should have fire background, or strategic fire training (or delegate fire responsibilities to a subordinate with those qualifications.)	*2*	
Goal 49. The tone and substance of briefings by Agency Administrators should be conducive to and emphasize safety.	*2*	
IS 1 – Revise the fire-related competency requirements for Agency Administrators.		2
IS 2 – Give examples to Agency Administrators of critical safety problems they can affect in meeting with Incident Management Team.		2
IS 3 – Develop refreshers or quick-help approaches for Agency Administrators.		3
IS 4 – Develop an attitude and ethic of professionalism that encourages retention and promotes safety behaviors.		
Goal 50. Incident Commanders at all levels must be selected on the basis of leadership ability as well as technical competence.	*1*	
IS 1 – Develop criteria for Incident Commanders, especially Type 3-5.		1
Goal 51. The Safety Officer position responsibilities, priorities, and independence should be more clearly defined.	*3*	
IS 1 – Reexamine and clarify the role and organizational placement of Safety Officers.		3
IS 2 – Set higher selection standards for Safety Officers.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 52. For extended attack (and larger) fires, someone needs to monitor operations to ensure compliance with established safety requirements, procedures, policies, and standards.	*1*	
IS 1 – Re-enforce the concept that everyone is responsible for monitoring safety.		1
IS 2 – Assign someone ad hoc to monitor safety during transitions when no Safety Officer is present.		1
Principle – Crews must not be pushed beyond their capabilities.[2]		
Goal 53. A method is needed to rate the capability (competency and condition) of a crew.	*2*	
IS 1 – Use a crew classification system of three or more levels.		2
IS 2 – Consider sub-types within a type of crew, especially for Type II crews.		3
IS 3 – Consider developing a smart "resource card" for fast check-ins.		2
Goal 54. The condition and competency of crews needs to be considered when making assignments.	*1*	
IS 1 – Require those who make crew assignments to consider the status as well as type of each crew (and other resources.)		1
Goal 55. Crew Supervisors must accurately report the status and competency of their crews.	*1*	
Goal 56. The equipment of crews should be reviewed and taken into consideration when giving them assignments.[3]	*1*	
IS 1 – Require Crew Supervisors to accurately describe the status of their crew at check-in. (The same applies to other resources.)		
IS 2 – Require Crew Supervisors to describe any equipment problems at check-in. (The same applies to other resources.)		1

[2] See also Goal 6-17, on fatigue.

[3] In a few places, such as here, two or three related goals are grouped together, with one set of joint strategies for implementing them.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Principle – Continue development of integrated, intergovernmental, interagency system.		
Goal 57. Further improve Federal-state-local interagency coordination.	***2***	
IS 1 – Expand official or ex-officio representation of local fire agencies on NWCG.		2
IS 2 – Further develop coordination with "GACGs."		3
IS 3 – Ultimately develop a nested set of interagency organizations.		3
HUMAN AND PSYCHOLOGICAL FACTORS		
Principle – Develop an attitude and ethic of professionalism that includes safety and encourages retention.		
Goal 58. Firefighters need to maintain an appropriate psychological balance, avoiding the extremes of paralyzing fear of the danger, unawareness of the danger, or overconfidence/complacency/denial.	***1***	
IS 1 – Promote the image of a well-balanced professional firefighter as a role model.		1
Goal 59. Recognize and promote the image of the professionalism of wildland firefighters.	***1***	
IS 1 – Define the concept of being a professional firefighter.		1
IS 2 – Refer to firefighters as firefighters, regardless of their job series.		2
IS 3 – Expand firefighter duties to include prescribed fires.		1
IS 4 – Expand other job duties and cross-training among lower-level firefighters.		2
IS 5 – Increase the autonomy of firefighters to adapt to conditions.		3
IS 6 – Develop a larger corps of professional firefighters.		3
IS 7 – Expand cross-training of a core group of firefighters.		2
IS 8 – Promote the concept of a professional "attitude of wisdom."		1
Goal 60. Maintain a zero tolerance policy for substance abuse at fires (including bases and camps).	***1***	
IS 1 – Enforce the existing policy.		1
IS 2 – Provide education on the policy and the need for zero tolerance.		2
IS 3 – Include alcohol and drug testing for fatalities and serious injuries.		2
IS 4 – Include being sober and drug-free as part of professionalism.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Principle – Maintain situational awareness.[4]		
Goal 61. Do what it takes to achieve and maintain situational awareness at each organizational level.	*1*	
IS 1 – Teach techniques for maintaining situational awareness in training courses from firefighter to Incident Commander.		1
Goal 62. Good communication is needed between crews working in proximity, especially one above the other.	*2*	
IS 1 – Mandate that crews and division supervisors be informed of the location of crews near each other.		2
IS 2 – Keep crews working at different elevations near each other in radio contact and informed of each other's plans.		2
Goal 63. Take extra safety measures in drought years.	*2*	
IS 1 – Activate regional interagency Fire Behavior Service Centers during drought years to increase available information and raise awareness.		2
IS 2 – Use other, less formal ways to keep firefighters informed about conditions.		2
Principle – Realistic, high quality training must be used to compensate for lack of experience.		
Goal 64. Training should be available, high quality, and consistent.	*1*	
IS 1 – Develop a needs-based strategy for training across agencies (i.e., matching training availability to the quality and quantity of training needed).		1
IS 2 – Develop a common approach to certifying instructors.		2
Goal 65. Accelerate learning by emphasizing the positive lessons from successful incidents, not just the negatives from failures.	*2*	
IS 1 – Identify positive case studies for use in training.		2
IS 2 – Reward and publicize people involved in making exemplary decisions.		2

[4] This also is related to well-trained leadership.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]
Goal 66. Training needs to be made more realistic.	***1***
IS 1 – Increase use of realistic field training and exercises.	1
IS 2 – Develop more case studies and simulations based on real fires.	1
IS 3 – Increase the use of simulations and interactive exercises.	1
IS 4 – Conduct skills training "in context" of realistic scenarios.	2
IS 5 – Provide realistic shelter training to all wildland firefighters.	1
IS 6 – Make use of live fires and prescribed fires for training.	
IS 7 – Improve quality of instruction.	2
Goal 67. Provide an adequate level of training to seasonals.	***1***
IS 1 – Analyze seasonals training needs (quantity as well as content).	2
IS 2 – Improve content and consistency of refresher training.	1
IS 3 – Lengthen "pre-season" for at least first time seasonals and certain specialties.	2
IS 4 – Provide more off-season training for seasonals.	3
IS 5 – Include in the Red Card system seasonals with ICT 5 or higher level certification.	3
IS 6 – Strengthen Smokejumper and Hot Shot refresher training with respect to safety.	2
IS 7 – Take advantage of down-time for training.	3
IS 8 – Provide incentives for seasonals to return.	2
Goal 68. Develop training priorities to make the most efficient use of the limited training resources.	***2***
IS 1 – Use overall training needs analysis to set priorities.	2
IS 2 – Target certain individuals.	2
Goal 69. Provide supervisors with training in leadership and supervisory skills.	***1***
IS 1 – Train supervisors, IMT members, FMOs, and dispatchers in key "human" skills.	1
Goal 70. Teach wildland firefighters the basics on hazards faced in the urban/wildland interface.	***2***
IS 1 – Train on the interface hazards to expect, and how to deal with them.	2
Goal 71. Maintain skills and safety awareness with on-the-job (and refresher) training. (Also accelerate the build-up of experience.)	***1***
IS 1 – Develop a formal OJT training program, including teaching supervisors how best to provide OJT.	1

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Goal 72. Provide training to crews on the reaction skills needed in dire emergencies that endanger them.	***1***	
Goal 73. Instill in each firefighter the necessity to switch modes and take extraordinary action in extraordinary emergency situations.	***2***	
IS 1 – Train on emergency skills at the individual level.		1
IS 2 – Train on communicating in emergencies.		1
IS 3 – Emphasize "stress-resistant" training.		2
Goal 74. Prepare leaders for decision-making under stress.	***1***	
Goal 75. Prepare the entire workforce, not just leadership, for working under conditions of stress.	***2***	
IS 1 – Develop a Decision Skills Training program.		1
IS 2 – Increase emphasis on "naturalistic" and "recognition-primed" decision-making.		2
IS 3 – Search for ways to reduce workload and stresses in the field.		3
IS 4 – Encourage self-development of ways to cope with stress.		2
IS 5 – Develop a catalog of visual indicators or cues of situational change.		2
IS 6 – Talk about stresses and raise awareness.		3
Principle – People must not be pushed beyond their capability.		
Goal 76. Monitor and reduce fatigue levels to safe limits.	***1***	
IS 1 – Limit the duration of field assignment to two weeks.		1
IS 2 – Assure comfortable, quiet sleeping conditions.		1
IS 3 – Improve dissemination of information on the need for adequate hydration and nutrition.		1
IS 4 – Conduct further study of sleep deprivation and other factors affecting fatigue of firefighters.		3
IS 5 – Use transportation or spike camps to reduce fatigue.		2
Goal 77. Crew Supervisors Division Supervisors and Incident Management Teams must get the information they need, but also be shielded from a flood of unnecessary information, and the risk of information overload.	***2***	
IS 1 – Be selective on what is broadcast and what is requested.		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
Principle – Foster physical fitness for the job*		
Goal 78. Develop a widely accepted physical fitness test for wildland firefighters.	*1*	
Goal 79. Physical testing must be conducted honestly and for all.	*1*	
Goal 80. Minimize wildland firefighter fatalities from health or physical conditioning factors.	*1*	
IS 1 – Finish validation and acceptance testing of the Pack Test series or another new physical fitness test, and rigorously enforce the new test.		1
IS 2 – Require contractors and encourage all others at Federal fires to meet the new physical fitness test.		2
IS 3 – Educate the workforce about the new test.		3
IS 4 – Hold testers accountable.		1
Principle – Foster unit cohesion.		
Goal 81. Foster better crew cohesion, especially among Type II crews.	*2*	
IS 1 – Adapt and adopt CRM-type training and attitudes.		1
IS 2 – Develop assessment instrument to periodically refine CRM-type training.		2
IS 3 – Infuse CRM principles throughout training.		2
IS 4 – Employ team building technologies when teams first meet.		2
IS 5 – Consider use of outside vendor for CRM development and training.		3
IS 6 – Develop work climate of trust through changes in the culture.		2
Principle – Practice safety day-to-day.		
Goal 82. Develop a safety culture that encourages people to think in the context of safe practices, standards, and procedures.	*2*	
IS 1 – In addition to all of the above, get firefighters and managers to raise safety consciousness in day-to-day activities.		2

* Reducing fatigue is a key aspect of human factors considerations, but could also be grouped under leadership issues.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[1]	
EXTERNAL INFLUENCES		
Principle –Promote prevention and fuel treatment programs.		
Goal 83. Educate the public on the limitations and dangers of wildland firefighting.	*2*	
Goal 84. Educate the public on the specific mitigating factors that may influence wildland fires and reduce damage from them.	*2*	
IS 1 – Promote public education on the limitations of firefighting and practical mitigation efforts through a variety of venues.		2
IS 2 – Broaden the efforts of the Wildland/Urban Interface Group, and link them to others.		3
IS 3 – Use the Internet.		3
IS 4 – Distribute catalog of public education materials.		3
Goal 85. Fire budgets and their allocation need to be set with an eye toward their implication for firefighter safety.	*2*	
IS 1 – Fund the new safety initiatives.		1
IS 2 – Get budgeters to clarify the potential impacts of different budget levels, including the shift to do more prevention and hazard reduction.		2
IS 3 – Inform firefighters and fire managers about the budget decision.		3
IS 4 – Modify the Fire Management Leadership course to reflect impacts of alternative budget strategies.		2
IS 5 – Develop an interagency fire prevention strategy as input to budget.		2
Goal 86. Improving forest health and removing accumulated fuels should be pursued to reduce the intensity of fires.	*1*	
IS 1 – Consolidate diverse strategies into a cohesive plan.		2
IS 2 – Consider using multiple funding options.		2
IS 3 – Amend the National Environmental Protection Act to require consideration of firefighter safety.		3

CHAPTER 1. INTRODUCTION

The purpose of this four-phase project is to identify changes needed in Federal wildland firefighting organizational culture, leadership, human factors, and accountability to improve firefighter safety over the long run. Too many wildland firefighters have died in the past decade from the same types of problems that had been seen in previous decades. It was decided by consensus of the five principal Federal agencies involved in wildland firefighting – the USDA Forest Service, USDI Bureau of Land Management, USDI National Park Service, USDI Bureau of Indian Affairs, and USDI Fish and Wildlife Service – that some underlying changes to the culture were needed.

Previous Phases

TriData Corporation of Arlington, Virginia and an associated team of consultants were selected to undertake this study in 1995. In Phase I, the perceptions of safety problems and potential solutions of approximately 1,000 wildland firefighters were obtained, 300 through one-on-one interviews and focus groups, and 700 through a detailed 25-page questionnaire. Phase I also included an extensive literature review on firefighter safety and on approaches used within and outside of firefighting to improve safety.[1]

With the findings of Phase I as a starting point, Phase II of the project formulated a set of 85 goals for improving wildland firefighting and defining a new organizational culture. It was based largely on the findings from the interviews and survey in Phase I. The survey sought evaluation of 160 "solutions" that had been recommended by firefighters. The goal setting also drew on safety experts within and outside of wildland firefighting. A report detailing the goals was published in February 1997.[2]

Phase III

This report presents the results of Phase III of the project; it describes approaches to implement the goals identified in Phase II and provides further background and details on various recommendations. With 86 goals identified – one was added in Phase III – at various levels of detail, scope, and importance, there was a challenge as to what was the

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[1] *Wildland Firefighter Safety Awareness Study – Identifying the Organizational Culture, Leadership, Human Factors, and Other Issues Impacting Firefighter Safety*, October 1996.
[2] *Wildland Firefighter Safety Awareness Study – Setting New Goals for the Organizational Culture, Leadership, Human Factors, and Other Areas Impacting Firefighter Safety*, February 1997.

appropriate level of detail to discuss implementation within the time and budget of the project, and the patience of readers. The approach ultimately taken here was to propose some implementation strategies for every goal, and to go into more detail on some of the newer, more innovative and potentially more important changes to the culture. As an outside consultant, it was felt that we had more to offer by focusing on the newer ideas – the implementations that were less straightforward and less a follow-on of existing work. We amplified some recommendations in even more detail in the Appendices. These cover a Center for Lessons Learned; On-the-Job Training; and Decision Skills Training.

Relation to Other Projects

This project is unique in the annals of wildland firefighting because of its systematic approach to listening to over one thousand firefighters at various levels; comprehensive, systematic thinking through of the changes needed in organizational culture, leadership, and human factors for safety; and identification of externalities that affect safety. This report represents a continuation of a body of work and ideas toward improving wildland firefighting safety. Most importantly, it builds on the reports that came out of the South Canyon fire in which 14 wildland firefighters were killed. It further builds on the Interagency Management Review Team report, the milestone 1995 Wildland Human Factors Workshop, the work of Ted Putnam on crew dynamics, the Snowbird Conference, the continued evolution of wildland firefighter training materials, and the extensive safety literature (which was summarized in the Phase I report Appendices).

Another unusual aspect of this project was the ability to draw on several groups of senior people over a several year period who contributed to the project from development of the Request for Proposal through intellectual contributions to the content and review of the reports. This included the five fire program directors; the members of the FFAST (Federal Fire and Aviation Safety Team), co-chaired by David Aldrich (of FS) and Paul Broyles (of NPS); a project steering committee chaired by Mark Boche (of FS); Carl Halgren (of Occupational Safety and Health Administration); and others listed in the acknowledgments. Many of these people "rolled up their sleeves" to not only review the reports and questionnaires, but also to participate themselves in extensive meetings and interviews with the members of the project team.

It was the responsibility of the contractor to pull the ideas together from various sources, make the decisions as to the overall package, and ultimately, to articulate the final recommendations.

To facilitate searching the Phase II report for the antecedent research, we kept the organization of chapters and order of goals close (but not identical) to those used in Phase II. Phase II, in turn, was consistent with the grouping of findings in Phase I. In developing an action plan for implementation, a further regrouping of recommendations by type of action might be desirable (e.g., all changes to training courses; all elements of a professional code of conduct).

Report Organization

In the Executive Summary, "pillars of wisdom" (or principles) are identified upon which to base much of the change needed in organizational culture.[3] In the remainder of the report, each of the 86 recommended goals is described in detail, with implementation strategies (i.e. recommendations) for each. There are over 200 implementation strategies in total. Some implementation strategies apply to more than one goal. Rather than be pedantic, we cross-referenced from one goal to another where that was appropriate instead of repeating the discussion of an implementation strategy in toto.

The body of this report follows the same general organization used in the Phase I and Phase II reports. After a discussion of Methodology (Chapter 2), separate chapters address implementation strategies for goals dealing with Organizational Culture (Chapter 3), Leadership (Chapter 4), Human Factors (Chapter 5), and External Influences (Chapter 6).

For each goal in Chapters 3-6 there is at least some brief background information on the issue, and one or more implementation recommendations for reaching the goal.. In several cases, additional background or ideas for implementation of a goal are discussed in much more detail in an appendix. We did not repeat here all of the information in the Phase I and II reports, and their Appendices. They are still important reports to read to understand the motivation for the goals here.

[3] With apologies to T.E. Lawrence, the famous Lawrence of Arabia, who wrote a book by that name.

A short conclusion (Chapter 7) recommends how to proceed with the implementation – that is, with changing the organizational culture. The final steps are laid out. The wildland fire community then must step in. Each recommendation should be assigned to someone (or some organizational unit) for action, and with milestone dates assigned. However, making the recommended changes is ultimately not the responsibility of a single person or group. Many people must each understand and do their part.

CHAPTER 2. METHODOLOGY

This chapter describes the starting point and the processes used to develop the recommendations in this report.

The basic approach taken in Phase III was to review each goal developed in Phase II, identify actions or programs that were already underway in the agencies toward implementing that goal, and then identify additional actions that needed to be started. Many ideas for implementation were raised in Phase I and Phase II of the study and they were resurrected for review in this phase. The original literature review in Phase I also raised many useful ideas that were drawn upon for Phase III.

Principles and Goals

The set of goals that were the starting point for implementation were those in the Phase II report. Because there were so many goals, and it is difficult to group the major themes, we made an attempt to abstract a smaller, higher level set of "principles" under which the goals – or at least the goals and actions thought to be the most important – could be grouped. This was attempted first at a joint working session in August 1997 with members of FFAST and the chairman of the Project Advisory Group, and two project team members. It was further developed as we produced the final report.

The problem in discussing principles and goals is that it is difficult to get a consensus on what constitutes a goal versus a principle – it is at least in part a semantic issue. The principle is the higher level idea. Rather than get bogged down in that exercise, there was a consensus of the FFAST, the Project Advisory Group, and the project research team that it was more important to concentrate on the specific actions needed than the taxonomy of organization. The 19 principles we identified under which all 86 goals could be placed are listed below.

The starting principle (#1) was to preserve the strengths of the current system of Federal wildland firefighting ("Physician do no harm"). The existing strengths of the Federal wildland firefighting system should be built upon. There is no need to start from scratch – much is working well. To move forward and overcome the many problems identified, the following additional principles were identified:

Leadership:

2. Assure that people in leadership positions are qualified and well trained.
3. Promote accountability for safety at all levels.
4. Practice safety day-to-day.

Experience:

5. Rebuild the level of firefighting and fire management experience.

Training and Certification:

6. Realistic, high-quality training must be used to compensate for lack of experience. Proper training also is critical for safety by teaching safe practices and developing proper attitude.
7. Ensure the integrity of the Red Card qualification system.

Communications:

8. Communications must be clear and understood.

Human Factors:

9. Crews and people must not be used or pushed beyond their capability.
10. Unit cohesion should be fostered and attention given to developing good crew dynamics.
11. Develop an attitude and ethic of professionalism that encourages retention and promotes safety behaviors.
12. Maintain situational awareness.
13. Foster physical fitness for the job.

Safety Data:

14. Collect reliable safety data and use it to target, prioritize, and evaluate safety programs.

Prevention:

15. Promote prevention and fuel treatment programs for their impact on firefighter safety as well as for their land management results.

Equity:

16. Promote safety for all who work at Federal fires (regardless of gender, ethnic group, and whether private sector, local or state government, or agency affiliation).

Technology:

17. Provide firefighters with safe and adequate protective gear, tools, equipment, and transportation (i.e., good technology).

Medical Care

18. Provide quick, high quality care for the injured.

Intergovernmental System

19. Continue development of integrated, intergovernmental, interagency system.

Wording of Goals – In almost every case, we left the wording of the goals the same as they were in the Phase II report. There was a consensus among reviewers that this set of goals spanned virtually all of the safety concerns raised in Phase I. Some minor rewordings of goals are shown in brackets in the goal statements.

Aggregation and Disaggregation of Goals – The goals stated in Phase II were regrouped in the course of Phase III by areas of expertise needed for implementation rather than under the headings they originally appeared, and assigned to different members of the project team. There are some implementation concepts that apply to more than one goal or groups of goals, such as increased realism of training, use of crew resource management (CRM) concepts, and increased accountability. Implementation ideas that apply to more than one goal usually are addressed under the first applicable goal, and then cross-referenced in the later goals. In a few cases, we grouped like goals, and discuss their implementation strategies together.

Priorities – We provide recommendations for implementing all 86 goals. However, we did not just treat all goals and implementation ideas equally. More time was given to critical needs and to innovative new strategies, and less to those areas where implementation was more straightforward or within the normal expertise of the agencies. Our recommendations on the priority of the goals and implementation strategies are given in the summary (Chapter 7).

Universality of Implementation– In some cases, ideas suggested here are already being done in one place or another, but are not yet adopted across all agencies (e.g.,

suspending people from firefighting for violating safety directives). In some cases, policy directs an action, but it is not performed as directed by part of the workforce. In both cases, recommendations are made to extend a practice to all agencies or all of the workforce. These are not new ideas, but are practices that need to be implemented more widely.

Keeping Up With Change – There is a great deal of change continually going on in the agencies. Some changes were stimulated by earlier phases of this work, but many originate independently. We have flagged, in footnotes or the text, the recommendations for which action is already underway, to the extent we knew of them. There may well be other recommendations presented in this report that are already underway. We did not drop recommendations that we heard were already in progress, both to avoid breaking up the logic of the recommendations and because we did not know the extent to which the reported changes were in fact implemented versus planned.

Tailoring Goals and Strategies to Subcultures – In general, implementation strategies are suggested with the whole workforce in mind. In practice, some tailoring will have to be done to reach different subgroups, such as Emergency Firefighters who are much more difficult to reach off-season than the others. We note some recommendations for particular groups, but it will probably be necessary to do another level of detailed planning and adaptation of some ideas for EFFs and others.

Processes

Meetings – During Phase III, three major review and brainstorming meetings were held in 1997, two in Boise and one in Denver. The first Boise meeting was comprised mostly of FFAST committee members, who provided input on almost every goal as to things already underway. A Fire Program Director also attended. The Denver meeting included both members of the FFAST team and those of the original steering committee who were still active on it. They reviewed a tentative set of "pillars of wisdom," the principles and specific strategies chosen for most emphasis. This meeting also provided further input from each of the five agencies on things already underway. A second special meeting was held in Boise with a group of training officers knowledgeable about the development of new training curricula. This meeting focused on suggestions for improving training that cut across many of the new goals.

Presentations – Additional feedback was received on tentative recommendations in the course of several presentations made during Phase III. These included a Forest Service Regional Fire Directors meeting; Agency Administrators advisory group; International Wildland Fire Conference in Vancouver, Canada in 1997; National Wildfire Coordinating Group meetings; two presentations to the Federal Fire and Aviation Leadership Council (FFALC) in January and February 1998; and a presentation to the Region 5 Hotshot Workshop, (Reno, Nevada, February 1998).

Use of Expert Consultants – TriData's consultants were used to brainstorm and provide recommendations on certain groups of goals. Of special importance were Michael DeGrosky, wildland fire and strategic planning expert, who contributed ideas throughout; Professor Charles Perrow, sociologist, Yale University, who assisted with ideas for improving communications, investigating injuries, professionalism, and other aspects of changing the culture with respect to safety; Gary Klein and Marvin Thordsen of Klein and Associates who summarized research in decision making, realistic training, on-the-job training, and other areas; Lark McDonald and Patrick Withen, who added key ideas from their own experience and research on crew resource management and crew dynamics and professionalism, respectively; and Dr. Jason Greenlee who provided ideas and literature research on a wide variety of topics.

Contacts with Agency People – Project team members spoke with many experts at various levels in the five participating agencies to get current on what was already being implemented and to get preliminary reactions to various ideas.

Further Literature Review and Internet Search – Much "mining" was done of the literature, especially information available in searching the Internet and World Wide Web. The footnotes indicate important references for specific recommendations.

Reviews of Drafts – The drafts of this report were reviewed by various members of the Project Advisory Committee, the Federal Fire and Aviation Safety Team, and Federal Fire and Aviation Leadership Council, and consultants to the project team. This was a dynamic process, with dialogue between the authors and reviewers. It produced many substantive contributions, and helped sharpen, improve and augment the set of recommendations. It also helped keep the terminology used here consistent with the latest Incident Command System usage. We considered all of the comments received, but ultimately the recommendations here are those of the project team, which was contracted to provide an outside, third party assessment and recommendations on the

organizational culture, leadership, human factors and external factors that underlay and influence Federal wildland firefighter safety.

The next chapter starts the discussion of the 86 goals and the implementation strategies proposed for each.

CHAPTER 3. ORGANIZATIONAL CULTURE

This chapter discusses implementation of the goals and principles dealing with organizational culture. These are the goals discussed in Chapter 4 of the Phase II report.[1] Subsequent chapters deal with "leadership" and "human factors" goals. Many goals could be listed under more than one heading.

Preserving Strengths

The vast majority of firefighters interviewed or surveyed as part of this study felt that the current overall Federal interagency approach to fighting wildland fires was good or excellent. They think the system needs many improvements but it is generally sound, and the agencies should preserve its many strengths. More than 80 percent of the firefighters surveyed believe that the system's strengths include:

- Concern of supervisors for the safety of their crews
- Recognition of the need for improvement in fire safety
- Good personal protective equipment
- The concern for safety now being accepted as part of the culture by firefighters
- Firefighters' generally positive attitude (committed, energetic, can-do, love the job)
- Air operations
- Specialized training and the use of Type I crews
- Forecasting of weather conditions
- The Incident Command System
- Interagency cooperation in firefighting
- Use of the "LCES" approach (Lookouts, Communications, Escape Routes, Safety Zones)
- Integrating people from all over the nation into a successful firefighting force
- Firefighters' adaptability and cross-training
- Fire reconnaissance

[1] For readers of the Phase II report, note that the goals in this report have been renumbered and in some cases reordered from the Phase II report, but all goals have been retained.

- Lessons learned from the South Canyon fire have led to more people questioning strategy and tactics
- Good transportation and equipment

This led to the first goal:

Goal 1. The existing strengths of the Federal wildland firefighting system should be preserved and built upon.

Implementation Strategy 1 – "Physician Do No Harm." Evaluate proposed strategies and changes to avoid unintentional negative side effects.

As they move forward to implement the goals and strategies outlined in this report, the agencies would be well advised to reinforce the strengths outlined above, build on the sound foundation existing, and make sure that proposed changes do not inadvertently damage something that is working well.

Implementation Strategy 2 – Disseminate information on what is perceived to work well.

In addition to taking care not to damage any good parts of the system, we recommend dissemination of the findings on strengths identified in Phase I so that firefighters throughout the system understand that it currently works well, and just needs improvement rather than a total revolution.

Implementation Strategy 3 – Fix the existing system first.

The current system should be used as a foundation upon which to build. Some safety problems are caused by not using the existing system well. The first approach should be to make sure the system is working as intended before trying new approaches.

Healthy Attitudes Toward Safety

Phase I of this study found that present attitudes toward safety were generally quite good. Most interviewees and survey respondents believe their supervisors and colleagues genuinely care about safety. However, a significant minority said they receive mixed messages about safety: they are being told safety comes first, but are then urged to achieve unreasonable fire management objectives. Also, some employees feel

uncomfortable about raising safety issues. One-fifth of the responding employees felt that their supervisors do not listen when they voice safety concerns. Many people also expressed concern about the potential for reprisal if they speak out about safety problems. Additionally, evidence suggests that firefighters do not generally regard speaking out about safety issues as a personal, individual obligation. This led to Goal 2 below. (Note also the section on individual responsibility for safety, Goal 8.)

Goal 2. A "Code of Conduct" should be established in which employees should have both the right and obligation to report safety problems, and to contribute ideas on their safety to their supervisors. The supervisors are expected to give the concerns and ideas serious consideration.

Implementation Strategy 1 – Disseminate directives – and otherwise spread the word – that each person is expected to report safety problems and to contribute potential solutions.

Firefighters should be held responsible for their own safety with respect to things they can detect and have control over.[2] Part of this professional responsibility is to report safety problems as well as contributing ideas for solving them. Another part of professional responsibility is related to following safe practices and preparing for emergencies, and is discussed later under Goal 8.

The professional responsibility to report safety problems starts with informing one's ***immediate supervisor*** of any problem. This includes administrators and managers as well as firefighters. If the problem is not solved at the first level (either the supervisor denies the problem, does not act on it, or cannot act on it), then it can be taken to the ***second level supervisor*** in the chain of command. If not solved there, it can be taken to the ***Safety Officer*** (or person given safety responsibility) for the incident. The appeal can continue to the ***Agency Administrator*** and ultimately the Area, State, and Regional levels.

This process already exists, but it is not well known, especially among seasonal firefighters. There is also reluctance to use it from fear of retribution, skepticism about getting results, the reluctance of people in junior positions to speak with higher levels, fear of losing prestige among peers, and reluctance to bypass one's supervisor.

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[2] The FFAST Team co-chair, Paul Broyles, proposed this very concept at the NWCG meeting in Boise on March 13, 1997.

To better advertise the process:

- Add a statement of the right and the responsibility to the (red) fireline handbook.
- Add it to the initial response pocket guide (developed by the Southwest geographic area).
- Add it to the card, with the ten fire orders on the reverse, that is given to all firefighters. (Perhaps call this the "Marana Card," in gentle, humorous analogy to the well-known "Miranda Card" carried by police to read arrestees their rights.)[3]
- Add the procedure to the posters that must be posted in incident bases.
- Emphasize in training courses, and by word-of-mouth, and by example that it is the responsibility of a professional to identify and do something about safety problems.
- Encourage the dialogue between raising safety problems and their supervisors to take place as a "respectful interaction."[4]

Implementation Strategy 2 – Train new firefighters to speak up about safety.

The agencies must train new firefighters to express safety concerns to their colleagues and supervisors routinely and assertively. This can be done by role playing, by giving examples of what and when things can be brought up, and other means. Getting the right mind-set from the start of their career will prevent attitude problems later on. Clearly describe the process in the basic (S-130) firefighter course. It is apparently mentioned now, but not directly enough.

Implementation Strategy 3 – Train supervisors to listen.

Fireline supervisors must be taught to accept the raising of safety issues as a firefighter's professional right and obligation. Additionally, the agencies must train their fireline supervisors to listen and foster openness by allowing crew members to present alternative views without criticism for raising them.

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[3] Much leadership training is conducted at the training center at Marana, Arizona.

[4] More on "respectful interaction" later. It originally was used to describe the dialogue between an aircraft crew under the "crew resource management system," and has been promoted for adoption throughout wildland firefighting by Karl Weick, a noted researcher on wildland firefighter safety issues.

To help make the point:

- Discipline supervisors who refuse to listen to a safety suggestion or problem that leads to an injury because it was not resolved in time. Publicize that anecdote among firefighters and supervisors using formal and informal networks.
- Publicize positive examples of supervisors who were not aware of a problem until it was pointed out by a firefighter. Publicize examples where procedures were changed in a geographic area, or even nationally, as a result of a suggestion coming up through the ranks.

Implementation Strategy 4 – Include the raising and handling of safety comments in performance ratings and accountability systems.

Both "the system" and individuals must actively hold people accountable for safety practices. NWCG working teams are already exploring one approach to improve accountability by incorporating responsibility for safety into new and revised Position Task Books (PTB). Safety and accountability must be integral parts of the PTB, and of personnel performance evaluations (in addition to real-time accountability for flagrant actions.) Each position has safety requirements essential to that position, and not delegatable to others. This strategy should be given high priority.

Implementation Strategy 5 – Involve employees in developing ways to get these ideas implemented in the field.

A culture of firefighter safety excellence will result from widely held attitudes, and should include an accepted "code of conduct" to help foster the desired attitude. Shared attitudes result from widely observed *behavior*. Thus the agencies should focus on changes that influence behavior of people on the fireline. To affect behavioral change, the agencies need to have a fireline safety policy that enjoys a great deal of consensus and field support, ultimately manifesting itself as conduct on the fireline. A consensus on, and widespread commitment to, the strategic goals outlined in this report will expedite their implementation, thereby facilitating the desired outcome of improved firefighter safety.

Commitment springs from involvement, and widespread commitment to organizational change demands the vigorous and systematic participation of the people expected to carry out change. This involvement should occur through an organized, methodical employee involvement process that encourages employees at all levels of all

agencies to influence how their organizations carry out this and other goals and strategies documented in this report.

For example, safety reviews are often conducted after accidents by people not involved in the incident, often slowly and considering policy issues. That is good, but also needed is for crew or team members to review and critique their own actions, preferably soon after the incident, and coming to some conclusions and lessons learned. Accidents and near misses need to face the glare of dialogue (without blame). Successes, too, need to be discussed and shared as models. The opportunity for post-action reviews must be identified in crew and team training, or firefighters will never look for the opportunities.

Another way to get employees involved is to form working groups with representatives from various position levels to address the implementation of ideas in this report.

Reaching Emergency Fire Fighters (EFF) employees to get their participation is more difficult. Besides informing them on-the-job, local "town meeting"-style gatherings could be held in villages, on reservations, or elsewhere to solicit ideas from those involved in firefighting. (This could be done through such organizations as Montana Indian Firefighter Program (MIFF), Southwest Indian Firefighter Program (SWIFF), Snake River Valley crews (SRV), Alaskan national firefighters, and others. Another opportunity may be at spring meetings of Crew Supervisors held at local levels.

Implementation Strategy 6 – Promote a single code of conduct (including the reporting of safety incidents) across agencies.

The agencies have worked to establish a "Code of Conduct" that focused on safety but did not specifically emphasize the reporting of safety issues, as is addressed in this goal.

In 1995, Jack Ward Thomas, former Chief of the Forest Service, established "The Chief's Safe Practices Code." Later that year, the Secretaries of Agriculture and the Interior released to all employees a memo committing to "Zero Tolerance of careless and unsafe actions" and establishing a "firefighting code of safe practices." In addition to the 10 Standard Fire Orders, the 18 Situations that Shout Watch Out and LCES, the Chief's code includes the following principles:

- Firefighter safety comes first on every fire, every time.
- The 10 Standard Firefighting Orders are firm…we don't break them; we don't bend them.
- Every firefighter has the right to know that his or her assignments are safe.
- Every fire supervisor has the responsibility to confirm that safe practices are known and observed.

The code of conduct selected must be part of a comprehensive approach to modify a wide range of overlapping agency and workplace cultures and subcultures. Those cultures and subcultures range across five decentralized agencies. The agencies need to maintain a single, unified code. Several goals discussed in various places in this report provide further clarification of the concepts to promote (e.g., risk assessment/risk management, and accurate reporting of safety incidents), and might be incorporated into a unified code.

Reporting Safety Incidents

The integrated collection and analysis of data on safety incidents must be established immediately. This is one of the highest priority recommendations from this project.

Collecting and analyzing data on safety incidents, and making use of the resulting lessons in training and operations, is at the heart of effective safety programs. By collecting and analyzing comprehensive, reliable safety data, the agencies can identify safety problems early and respond appropriately. Additionally, the agencies need the data to evaluate their overall safety performance and to confirm that time and effort invested in new safety practices are effective. The data also is critical to setting priorities among competing safety issues.

An integrated database is needed not only on injuries and deaths, but also on the incidents and details of entrapments, shelter deployments, and other near misses that, often by chance, do not result in injuries, but give insights on problems.

Further, it is desirable to get information from employees on perceived safety problems that may not have led to an incident or near miss yet. This type of data may be

tabulated ("number of complaints about…"). Even though it is not the same sort of hard statistic as the above data, it is still of great interest. Many aviation safety problems have been headed off by this type of anecdotal information, especially when several anecdotes appear from different quarters about the same issue.

At present, the agencies are struggling to obtain thorough accident information. There is no central reporting system, aside from the OWCP (worker's compensation) form, despite several efforts to create a system. Reporting varies widely not just across the five agencies (and especially between the two larger governmental departments – Agriculture and Interior), but also across different regions, divisions, units, and assignments, within the same agency.

We strongly recommend that all five agencies develop a single incident report form, similar to the National Fire Incident Reporting System (NFIRS) reports, which can be used to develop consistent statistical information. The form would include sections to describe the above events, as a matter of routine. The five fire programs have undertaken several efforts toward a common system of reporting, but none has reached fruition yet. The form/process needs to be simple and direct so it can be completed on a timely basis. If the reporting system gets too cumbersome, it will not yield timely or accurate data. Any data system should be expected to evolve over time, as flaws are found and the list of necessary and useful data elements gets modified.

Many firefighters said in interviews and on the survey that they do not report safety-related incidents 1) out of fear of discipline or reprisal, 2) because the reporting system is inconvenient, 3) because they believe that the report will not be acted on, or 4) they fear losing hard-earned credibility. A new reporting system must address these concerns. It must have an analysis and dissemination component as well as a reporting component.

According to key findings of the Human Factors Workshop, the current system for reporting entrapments works to some extent, but not adequately.[5] Some entrapments are reported only after long delays, and some are not reported until someone follows up on rumors and pressures a person or crew to fill out the forms. Despite these difficulties, the

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[5] USDA Forest Service Fire and Aviation Management, Findings of the Human Factors Workshop, Missoula, Montana, 1995. The strategies for Goal 3 reflect key findings of the workshop.

agencies have collected a wealth of data on entrapments, fire shelter deployments, and other incidents. That data is currently compiled and stored, but not well utilized.

The agencies must implement a unified, interagency system for collecting and tracking data on all near miss, injury, entrapment, shelter deployment and fatality incidents. In addition, they need to refine their investigation protocols and the method of carrying them out.[6] The design of the system should take into account the needs of the analysis protocols, and be under the auspices of the NWCG.

Once collected and analyzed, the facts on safety performance must get disseminated down to individual firefighters to achieve maximum learning benefits. The aviation community, the National Aeronautic and Space Agency (NASA), the U.S. Army and Navy, and U.S. Fire Administration employ successful systems to disseminate safety information. These systems represent valuable models for the five agencies involved in this study. The above considerations led to the following three goals.

Goal 3. Every employee is expected to report a) injuries (and of course fatalities), b) entrapments/shelter deployments/burnovers, and c) near misses.

Reaching this goal requires two approaches: 1) development of a system to facilitate reporting and 2) encouragement of employees to report, and giving them proof that they will not be harmed or reprimanded for doing so. The second point, encouraging reporting, was basically covered by Implementation Strategy 1 of Goal 2 above. The strategies below focus on the development of a reporting system. Note that Goal 2 dealt with reporting in the sense of employees telling their supervisor about problems they observe; Goal 3 deals with formal reporting of incidents to a central repository of data and information.

There is a significant issue left to resolve: how to promote accountability for bad decisions and yet also encourage reporting. At least a partial answer is to hold people

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[6] At the fire directors semi-annual meeting on March 11-12, 1997, it was decided that an improved system for reporting safety incidents should be developed by June 1997. Part of the decision was to include a method for reporting near misses. This assignment was never completed. There also was an "Interagency Fire Statistics Task Force Group" charged with developing a "Standardized Fire Statistics Summary" report. Fire casualty reporting can be linked to fire reporting, to prevent redundancy, as was done with NFIRS. Although originally scheduled for completion in March 1997, this effort is still going on, and has thus far identified over 200 desired data elements to be collected on each fire – too many for practical, routine reporting.

accountable who do not file reports they are supposed to, but also use good judgment on appropriate corrective actions, too.

Implementation Strategy 1 – Develop a common interagency reporting system.

The agencies currently use multiple databases, hampering a consolidated effort. The Forest Service is keeping their accident data in an Office of Workers' Compensation Program (OWCP) format, while the Interior agencies use Form DI 134 and the Safety Management Information System (SMIS). An integrated, interagency approach needs to be established for reporting non-injury accidents and "near misses" as well as injuries and fatalities. It requires development of supporting policies, procedures and reporting instruments. A comprehensive approach will include a single definition of a reportable incident, and methods that encourage both traditional, overt reporting mechanisms and anonymous, penalty-free reporting. The system should encourage firefighters to report unsafe actions in addition to near misses and other safety incidents. When no injury is involved, the reporting can be anonymous and even be about one's own actions, as is done in aviation safety reporting.

At present, despite repeated efforts by working groups to establish a reporting system, there is not yet a satisfactory system in either the Department of Agriculture or Department of the Interior. The current Wildland Fire Entrapment/Fatality Report form (NWCG) provides a good starting point, but requires expansion to include injuries and near-misses. A reporting system that would roll-up data for agency and interagency combination would facilitate a coordinated monitoring and evaluation effort by the NWCG and FFAST. Another alternative is to expand on the Department of the Interior SMIS injury reporting system, which allows for a "functional data set" (special set of data elements) to be added for a function such as wildland firefighting. The newly revised version of the National Fire Incident Reporting System has a firefighter casualty module, and the new wildland system could build on that as a starting point for its data elements.

There may be several reportable "safety incidents" associated with a single fire incident. The data system must be able to analyze the data either; in terms of the number of incidents with casualties or the number of casualties, subdivided in various ways.

Part of the challenge is the sheer number of incidents. The Forest Service alone may respond to 12,000 to 14,000 incidents in a given year. If accidents occur even at a low rate per incident, we are still managing data on thousands of occurrences per year.

Design of a reporting system needs to be based on the simple question: What information is needed to identify the causes of accidents or the trends? The answer identifies what minimal data are needed and what analysis procedures are called for. From this, the actual design of the collection process is derived, with concentration on minimal data needs and easy, efficient reporting.

A position or function in each of the fire agencies, a "lessons learned coordinator," needs to be the focal point for turning in the data for that agency to a central source, which could be in one of the agencies or with an outside contractor. (Perhaps the FFAST representatives or their designees could play that role in their agencies.)

Any interagency data system developed should be coordinated with the NWCG and its Information Resource Management Working Team (IRMWT) and its Safety and Health Working Team (SHWT).

Data Elements – Defining the specific data elements to use across agencies required in reporting casualties, near misses, and burnovers requires a collaborative effort involving safety analysts and data analysts. As a catalyst to respond to, a list of data elements to consider is shown in Exhibit 3-1. These are meant to be suggestive, and not a definitive list. (They have some redundancy and may have some gaps.) A sorting is needed of the elements to be reported by a person in the field versus the elements reported by an investigation team. The list is long, and compromises have to be made between what can be reasonably collected routinely, and the need to capture many details of potential use in formulating corrections.

The list of data elements should evolve over time. If there is not a good consensus on the data elements that are both feasible and useful to collect, the list of mandatory data elements can start small, with open ended questions used more freely. Then, after analysis, more elements can be prescribed as required.

Starting with a short list of data elements and having firefighters suggest additions can help increase the acceptance of the ultimate system. Also, to improve credibility,

allow people to ignore the irrelevant data elements or a particular case, and to report "unknown" for an element if that truly is the case.

Exhibit 3-1. Some Data Elements to Consider in Casualty, Near Miss, and Burnover Reporting

Data Elements	Situation
Basic Data	
Type of situation, (e.g., fire-related fatality or injury, non-fire fatality or injury, entrapment with shelter deployment, entrapment without shelter deployment, etc.	All
Date/Time	All
Location of incident (by geographic area and by region/ state/ administrative units)	All
Agency (or agencies) responsible at incident	All
Number people and job functions of people entrapped	All
People Entrapped	Entrapment
Shelters deployed	Deployment
Type of resource involved (e.g., Smokejumpers, Type I crew, helitack/rappelers, Type II crew, engine crew, tractor/plow driver, Incident Management Team, support personnel, other)	All
Age and gender(s) of personnel injured, trapped, or otherwise at risk	All
Agency affiliation of involved personnel	All
Originating location of personnel involved (region, state)	All
Was resource local or from out of region?	Entrapments, deployments, multiple victim
Accident/Injury Specific Data	
Narrative/chronology	All
Fire behavior analysis	All fire-behavior-related incidents
Equipment analysis (Was PPE being used and did it perform as designed?)	All

Data Elements	Situation
Was equipment a contributing factor?	All
Nature of injury (e.g., strains, sprains, burns, etc., following NFIRS)	All
Proximate cause, e.g., – overexertion – slips, stuck by object – vehicle accident – responding – vehicle accident – operations – vehicle accident – returning – vehicle accident – transportation – hit by vehicle – aircraft incident (fixed wing) – aircraft incident (rotary) – stepped-on/contact with object – exposure to heat, fire, smoke, other fire products – weather/environmental – caught or trapped – workplace violence – other NFIRS categories	All
Type of activity, e.g., – hoselays (building, advancing, breaking down) – water supply – pump operations – line construction – handline – line construction – mechanical – heavy equipment operation – incident command/Incident Management Team (fireline) – incident command/ support/ logistics (non-fireline) – smokejumping – rappelling – chainsaw use/tree felling – in transit – base/ICP/staged – other	All
First aid/medical attention required, (e.g., injuries treated on-site only, injuries treated at incident facility only, off-site medical attention required, hospitalization required).	All

Escape and Deployment Data

Were adequate safety zones and escape routes established and known?	Entrapments, deployments
Were survivable safety zones that did not require shelter deployment available?	Entrapments, deployments
Were escape routes used?	Entrapments, deployments
Were survivors/victims in a designated safety zone?	Entrapments, deployments

Data Elements	Situation
Were shelters deployed properly/shelter training followed?	Entrapments, deployments
Incident Management Team	
Contributing factors considered (explain any yes answers):	All
Were current tactical safety guidelines/SOPs being used/ followed/adhered to?	All
Was an ICS organization properly developed/evolved for the scope of the operation?	All
Were radio or other communications a contributing factor?	All
Were briefings conducted and adequate/were instructions clear?	All
Were staffing appropriate/resources adequate?	All
Did agency/interagency policy contribute to accident?	All
Did management decisions contribute?	All
Was there on-site operational accountability by the Incident Management Team?	All
Strategy and Tactics[7]	
Did Agency Administrator/WFSA alternatives consider the current and anticipated condition?	Entrapment, deployments, multiple injuries
If so, did the incident objectives adequately reflect those conditions?	Entrapment, deployments, multiple injuries

[7] Questions on strategy and tactics need to be thought out further; these are some starting points, to be refined.

Data Elements		Situation
If so, did the strategy selected reflect those conditions?		Entrapment, deployments, multiple injuries
– Was strategy balanced with available resources? – Appropriate for fire behavior and available resources? – Designed to ensure firefighter safety?	– Implemented as planned? – Was this fire fought without violating current tactical safety guidelines/ SOPs or policy?	Entrapment, deployments, multiple injury
Did the tactics conform to the current and anticipated conditions? – Were adequate resources assigned to implement the tactics? – Was the LCES process followed? – Other problems?		Entrapment, deployments, multiple injury
Was there an adequate command structure/cohesive organizational structure in place and functioning?		Entrapments, deployments, multiple injury
Was this a wildland-urban interface fire?		All
Was command/resource transition a contribution factor?		All
Was this a wildland-urban interface fire?		All
Was command/resource transition a contributing factor?		All
Personal Performance Data		
Was the quality of supervision and leadership a factor?		All
Physical fitness a contributing factor/in compliance with current standards?		All
Fatigue?		All
What role did human error play?		All
Personnel Training and Qualifications		
Training, qualifications, and experience of personnel involved (training and experience records examined).		All

Anonymous Reporting – The NASA CallBack system, used to monitor aviation mishaps, provides an excellent and proven model for how to obtain anonymous, sanction-

free reporting of safety problems. The CallBack system and its associated Callback newsletter are the effort of the NASA Aviation Safety Reporting System (ASRS). The system utilizes NASA as an expert but impartial organization outside the airline/aviation/FAA community, and encourages pilots and flight crews to report accidents, near-misses or unsafe behavior at the earliest opportunity without a penalty. By assessing penalties for not reporting, the system provides additional incentive to report.

To achieve the aims of this goal, the five agencies should establish a "CallBack"-styled reporting system that can be used for both "signed" and anonymous reporting. The system should allow reporting via the Internet, a 1-800 hotline and a mail-in system to increase convenience of reporting – a key element to encourage comprehensive reporting. The hotline and CallBack system might be administered by a non-government organization to help assure confidentiality and promote greater use.

Incident Base Survey Form – To supplement the above approaches, anonymous survey forms could be placed in incident bases for everyone's use. Consideration might be given to making the forms available even at incidents without incident bases. To obtain effective feedback, the survey effort would have to:

1. Use a simple, straightforward approach.
2. Assure the respondent that the questions are objective and not leading to, or supporting "an agenda."
3. Use a form that is easy to understand and requires minimal effort on the respondent's part. Survey cards might be placed on tabletops at mealtime.
4. The respondents must see some result from their effort. The Incident Management Team might post statistics and issues raised on the base bulletin board, and the questionnaires could be used by the Safety Officer and Incident Commander (IC) to generate safety items for the incident action plan and operational period briefings.

The prime purpose of these forms is to get a more compete count of problems, get some quick diagnostic comments form those who were there. It also lets people vent, but that can be counterproductive in the long run if they do not see something useful done with their comments. Consideration must be given to whether this incident base survey should be mandatory; some voluntary forms have not worked in the past.

A rough example of a brief survey form is shown below. (Again, this would need testing and refinement.) Start with just a few simple, specific questions and leave several open-ended. After a while, refine the forms based on the quality and quantity of responses, and their usefulness for identifying safety problems

Your Type of Crew or Resource_____

Were your safety concerns adequately addressed on this fire?_____Y/N

Were you very concerned about your safety or the safety of your crew at any time? _____Y/N

Did you or your crew have what you would describe as a "near miss" or "close call," or other safety problem on this incident? _____Y/N (If so, describe in detail below.)

Did your supervisor demonstrate concern for your safety at all times?_____Y/N

Did your supervisor discuss safety with you and your crew? _____Y/N

Did the Safety Officer talk to your crew or supervisor? _____Y/N

Other Comments_____

Respondents could drop the forms in any of several boxes left around their base. A pattern of comments would trigger the Safety Officer to intervene with supervisors to correct the situation. The forms would also allow the Incident Management Team to collect data for later analysis by agencies or the NWCG to evaluate safety initiatives.

The intent is to provide an accessible, non-threatening system to promote reporting. However, the agencies must formalize the reporting mechanisms and establish protocols to prevent the unintended consequences of unsubstantiated accusation or safety reporting as a method of character assassination, which has happened in some instances in the past.

Accountability for Interfering with Reporting – Swift and severe disciplinary action, consistent with agency disciplinary procedures, should be taken against anyone found to have interfered with an employee reporting a safety incident, made a reprisal, or knowingly misused the reporting system to damage another party. Firefighters should not

have the option of failing to report entrapments, shelter deployments, or other fireline incidents without a penalty.[8]

In short, the development of an interagency safety incident system that provides good data is of the highest priority. It is key to many other recommendations, monitoring change over time, and setting priorities for other actions.

Implementation Strategy 2 – Incorporate basics on safety reporting in training courses.

Courses for firefighters, advanced firefighters and Crew Supervisors should adequately clarify the incident reporting requirements for an injury, fatality, entrapment, shelter deployment and near miss and at least a rough outline of reporting responsibilities, procedures, and protocols.

Goal 4. The five agencies should strive to obtain a clear, quantitative picture of the pattern of safety incidents, their causes, trends, and the lessons learned; and to identify potential problems at the earliest time possible.

Achieving this goal requires 1) analyzing the safety data on a routine basis and 2) disseminating the information throughout the wildland firefighting community.

Implementation Strategy 1 – Analyze and publish safety data.

A comprehensive safety report should be published annually – starting now, with available data – showing trends in the number of deaths, injuries, near misses, and entrapments; the types of casualties and their causes; and lessons learned. Also to be reported are the number and nature of safety problems reported openly or confidentially. Data on fatalities, entrapments, and shelter deployments already is analyzed by the agencies annually (there are usually only a small number). Wildland firefighter fatalities also are analyzed in the annual U.S. Fire Administration report on all firefighter fatalities. Data on the other aspects of safety are not routinely reported.

The results of the annual analysis should be disseminated in several ways:

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[8] The larger issues of accountability beyond just for reporting safety incidents are discussed under Goal 6.

- An annual safety report widely distributed to fire managers and Agency Administrators, and accessible to all.
- Highlights disseminated via an article in a safety newsletter that goes to all fire personnel. This should include positive and negative examples ("stories") of safety problems.
- Dissemination of the reports to instructors of fire courses at the National Advanced Resources Technology Center (NARTC) near Marana, Arizona, regional training centers, or elsewhere.
- Dissemination to curriculum development teams or committees, so they can use recent examples and lessons learned from safety incidents.
- ***Safety Newsletter*** – NASA, the U.S. Army and Navy, and the aviation community have successful mechanisms to disseminate safety information that can be models for the fire agencies. The five agencies should establish a safety newsletter, similar to the previously mentioned Callback Newsletter (NASA-ASRS), or the magazine Safety Line (U.S. Navy), or Flightfax (U.S.Army) with the intent of widely distributing stories about accidents and near misses to the individual firefighter, along with a scorecard (statistics) on safety performance.

Implementation Strategy 2 – Establish a safety-oriented Center for Lessons Learned.

Another important type of information on safety is examples of good and bad decisions, and analyses of the way critical situations were handled. These examples can provide key insights for organizational as well as individual learning.

Many different organizations are currently attempting to compile their "lessons learned" in a usable way. Of special note is the U.S. Army's Center for Army Lessons Learned (CALL) and the aviation community's ASRS system. A recent issue of *The Economist* (October 4, 1997, pp. 79-80) reports that the banking industry is trying to set up a method for capturing lessons learned modeled on the ASRS. The *Wall Street Journal* article of May 23, 1997: Lessons Learned - Army Devises System to Decide What Does, and Does Not, Work - The Real Value of Experience, reported on the Army's Center as a model to emulate:

> *The lessons-learned system now is getting some attention in corporate America. Management experts say the Army outstrips many companies in learning from experience. "The Army has perfected a remarkably efficient*

process for correcting its mistakes and sustaining its successes," concludes a recent case study by The Harvard Business School..."

In 1985 [the Army] founded the Center for Army Lessons Learned at Fort Leavenworth, Kansas. At CALL, a small group of seasoned officers collected the lessons, codified and distributed them. One early lesson – Tanks placed on hilltops to gain a clear field of fire are almost always destroyed.

The analysts quickly learned that the more hectic the operation, the more important is an organized system of collecting lessons learned. Otherwise, warns Col. Richard Sayre, head of Advanced Concepts Directorate of the Army's Advanced Warfighting Experiment, the process degenerates into exchanges of "Here's what I thought..."

The remaining challenge is to ensure that lessons are applied. For example, the GAO found that problems leading to the Army's "friendly fire" casualties in the Gulf War had been spotted two years earlier but ignored...

...Then, in 1995, came Bosnia, which was ideal for the process because the problems were difficult and new but generally not lethal. Rather than let each unit develop its own operational lore, Maj. Gen. William Nash, the U.S. commander, ordered that even operations such as routine convoys get intense reviews. "We must be a learning organization," he said.

Lessons were forwarded to CALL representatives, and the best ones were e-mailed to all units...

...Harvard's Professor Garvin says any corporation can adapt this process to collect information, compile lessons and disseminate them. "The key is to understand that no project is complete until it is systematically reviewed and its lessons learned," he adds. What the process does, says Maj. Gen. Robert Scales, who wrote an Army study of Gulf War preparations, is to "sharpen your leaders."

The Army's Center is aimed primarily at improving performance, not just safety. The concept for a wildland fire agencies Center could be broadened to that scope, but we recommend starting with a safety focus.

We recommend that the five fire agencies establish an interagency Center for [Safety] Lessons Learned. We recommend using the Center to collect and disseminate sanitized incident accounts to increase organizational safety learning. This center could also be the central point for collecting safety incident reports, but some experts feel the two functions should be kept separate, to encourage anonymous or confidential reporting to one, and routine reporting of incidents to the other.

A discussion of how to develop a Center for Lessons Learned for the wildland fire community may be found in Appendix A. The Center could be developed under the NWCG either in-house or under outside contract, and/or through the NARTC (located

near Marana, Arizona). There are many alternatives. The following are a few of the key ideas for establishing a Center:

- The Center would have to ensure anonymity, prevent retaliation, and facilitate communications of cases to it.
- The Center would encourage firefighters and fire managers to submit incident accounts motivated by improving the professionalism of the organization. Financial incentives do not seem appropriate here, and might even be counter-productive.
- The Center would select the best incident accounts and format them as case studies, simulations or "Tactical Decision Games" (discussed in Chapter 5 under decision training). In this way, the agencies would arrange a feedback mechanism for using the most difficult cases as training opportunities.
- The Center would disseminate lessons learned through newsletters, articles in fire magazines, tape recordings, and other means.

An organization designed to collect and disseminate lessons learned, regardless of the format used, can be a highly valuable component of a safety program for the agencies participating in this study. A learning process is triggered by each safety incident. The fact that the agencies have set up such an organization will send a message that everyone is expected to contribute to a culture of safety. This strategy should be implemented in concert with others outlined under Goals 3, 4 and 5.[9, 10]

Goal 5. All wildland firefighter fatalities should be investigated in a consistent manner to glean lessons for averting future fatalities.

Implementation Strategy 1 – Develop interagency protocols for the process and substance of investigations.

Since the Phase II report was published, a working group from the five agencies in 1997 drafted a proposal outlining the qualifications for investigative teams and the process by which they will be appointed. An interagency group also is developing an investigation

[9] Some initial steps toward developing a Center for Lessons Learned are being taken already at the NARTC near Marana. John Roberts and Buck Latapie (Forest Service) can be contacted for more information.

handbook. That handbook should include guidelines on the specific data to be collected by the investigative team, including human factors information. Additionally, the agencies should investigate incidents involving near-fatal injuries and incidents where multiple firefighters sustain serious injuries with the same vigor as fatality incidents.

A firefighter fatality autopsy protocol has been developed by the U.S. Fire Administration and should be part of the wildland protocol. The National Institute of Occupational Safety and Health (NIOSH) started investigating all firefighter fatalities in 1998. Some coordination ground rules need to be established with them and USFA, which investigates multi-fatality incidents.

In addition to the usual elements of a firefighter fatality (nature of injury, action at the time of injury, protective gear, narrative, etc.), the investigation should include the following:

- Interviews with multiple people at the scene as to what took place and how the problems could have been avoided.
- Why the incident occurred, as well as what happened.
- Contributing factors.
- Lessons learned.

Accountability

Among firefighters' strongest feelings for improving safety was the need to hold people accountable for the safety decisions they make. Firefighters surveyed in this study listed accountability as one of the areas most in need of change.

THE DEGREE TO WHICH ACTION IS TAKEN TO IMPROVE ACCOUNTABILITY WILL BE ONE OF THE BENCHMARKS BY WHICH FIREFIGHTERS WILL JUDGE WHETHER THE CULTURAL CHANGE IS TO BE TAKEN SERIOUSLY.

[10] The International Association of Wildland Fire has been keeping a reporting of accounts of safety incidents, including "near hits." Their information has been disseminated through their *Wildfire* magazine and Websites, and provides another example of making "lessons learned" accessible.

Many firefighters complain that safety violations and deficiencies are never reported to the offender's home unit, options for discipline are limited and the same unsafe people continue to show up on fire assignments. Even when an offender is sent home, he or she often goes out again on the next fire.

Lack of accountability has been a problem at high levels as well as at the firefighting level. Firefighters need to know that an Agency Administrator who demands more than is reasonable with existing resources will be held accountable as surely as a Crew Supervisor who violates fire orders.

If handled properly, accountability can be a source of professional pride. Unfortunately, too often accountability is handled poorly and undermines crews, teams, and entire organizations. What is needed is a fair system that restores accountability and confidence, but recognizes the difference between performance and competency issues, versus policy violations requiring punitive discipline.

Goal 6. Individuals at all levels should be held accountable for safety violations.

Implementation Strategy 1 – Start a policy of removing safety violators from the job.

As noted earlier, there was a very strong feeling from all ranks surveyed, firefighters through incident commanders, that those who make serious errors in judgment or disregard safety should be held accountable. Certainly there should be "due process", but individuals can be removed from their immediate job or task, and put on administrative leave or returned to their non-fire job or given another assignment while a casualty, burnover, or near miss is investigated, and before any disciplining action is taken. (This is similar to what happens when a police officer discharges a weapon in the line of duty, or a pilot has an accident.)

If a serious safety violation was committed, the "punishment" might be remedial training, being required to work under a "coach" on one's next assignment, being demobilized, having one's qualification level reduced, or even suspension for a week, a season, or permanently, depending on the severity of the offense. Sending someone home from a fire for a safety violation and then immediately reassigning them to another fire should not be done. Some people should not be or cannot be firefighters or fire leaders; they need to be weeded out if they cannot be trained and perform work to standard.

The National Park Service already has a strategy to stand-down people who commit serious safety infractions. This policy includes both fireline violations and fire program management violations. We recommend that all five agencies adopt this or something similar as a common policy.

People at all levels must be subject to this policy. Suspension from fire duty could be for a single incident, a short period or long period of time. The ultimate punishment would be permanent suspension, i.e., revocation of certification or the authority to manage or direct a fire program.

Implementation Strategy 2 – Follow-up on reported safety infractions.

The agencies should establish a joint policy that all reports of serious safety infractions will be investigated. The policy should mandate that, upon verification and establishment of responsibility, some action will be taken – remedial training and/or coaching, progressive disciplinary measures, or de-certification.

Implementation Strategy 3 – Consider safety performance in performance reviews and promotions.

An individual's safety performance and approach to risk management should be considered explicitly. It should be an item reviewed and discussed as part of each performance evaluation for anyone taking a fireline assignment. Safety performance and risk management should be criteria added to position descriptions and/or selection factors for all fire positions.[11]

Implementation Strategy 4 – Add training in accountability.

Emphasize accountability in the fire management training curricula by expanding the discussion of accountability in S-201 (Supervisory Concepts and Techniques) and S-301 (Leadership and Organizational Development). Include the duties of "working supervisors," on-site supervision, and accountability through physical observation and

[11] This is being considered as part of the work of the task group on competencies for fire management positions, and is to be presented to the FFALC in June 1998 for approval.

inspection of work. The concept of accountability must include providing for the safety and welfare of one's assigned personnel for the entire period of supervision.

Implementation Strategy 5 – Include accountability in operational guidelines.

Restore the concept of accountability to operational guidelines. An interagency Task Group examined and made recommendations involving the duties and responsibilities of Division/Group Supervisors relative to the duties which were performed by Sector Bosses under the Large Fire Organization that existed prior to the adoption of the Incident Command System (ICS.) The Task Group's evaluation and recommendations strike at the heart of the accountability issue. However, their recommendations were somewhat "soft" in nature, and follow-up NWCG action softened their recommendations even further. We recommend that the five agencies, working through the auspices of the NWCG, should adopt the recommendations of the interagency task group with the following slightly revised wording to strengthen the changes:

1. Revise the Position Task Books for the Division/Group Supervisors, Task Force Leaders, and Strike Team Leaders, and strengthen those weaknesses identified in the analysis. (These books are currently under review.) Add job responsibilities d, k and l from the "old" sector boss position to Position Task Books as was recommended by the NWCG Interagency Task Group. Add guidelines for frequency of line inspection to responsibility l.

2. Emphasize implementation of the segment concept from the Incident Command System Operational System Description 120-1. Use annual Incident Management Team meetings as opportunities to retrain/reorient teams to the use of segments. Incident Commanders, Planning Section Chiefs and Operations Section Chiefs will be trained to consider and implement segments when establishing division boundaries.

   Make it clear that the Division/Group Supervisor has more flexibility to delegate management of segments and various resource types if there is a task force leader in place rather than a strike team leader.

3. Evaluate the training curriculum and revise courses as necessary to ensure that the use of segments is presented. Ensure that all appropriate trainees are

taught the concept of delegating the management of personnel and a geographic piece of ground to form a segment.[12]

4. Distribute the above information through appropriate channels (training courses, newsletters, guidebooks, Position Task Books, etc.).

Implementation Strategy 6 – Provide guidelines for accountability.

The agencies, through the NWCG, must provide Strike Team/Task Force Leaders, Division/Group Supervisors, and Safety Officers with job aids (clear, concise references) that deal with accountability and formalize a system by which they can formally demand safety compliance. For example, a Division/Group Supervisor or Safety Officer might employ a list of things to check for such as Lookouts, Communications, Escape Routes, and Safety Zones (LCES) and other tactical guidelines to evaluate fireline performance. If departures from the guidelines were observed, they would require the offending crew or other resource to stand-down until the observed departures were corrected. This approach will also reinforce the responsibility for on-site accountability by fireline Incident Management Teams as discussed elsewhere in this report. It is interesting to note that, in a recent field study, observers found that 40 percent of firefighters were unaware of the day's safety briefing messages.[13]

Ability to Refuse Assignments – In dealing with wildland firefighter cultural attitudes toward safety, one of the cutting edge questions is, should an employee be able to refuse a fireline assignment or tactic because he or she perceives it to be unsafe for themselves, their crews, or others? Some believe this to be a key to improved firefighter safety, and a fundamental aspect of being accountable for the safety of your crew and yourself. Others believe that whether an assignment is "unsafe" can be a matter of perception and experience, that some firefighters will refuse assignments simply because they do not want to do them, and that fireline anarchy will result. However, individuals and Crew Supervisors routinely refuse assignments and pull back to safe locations when unsafe situations exist.[14] The practice does not seem overused; if anything it is underused.

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[12] A segment is a geographically defined sub-unit of a division.

[13] Jason Greenlee; Observations on Three Large Fires in Canada and the U.S., Canada/U.S. Wildland Fire Safety Summit., Rossland, B.C., September 30, 1997. The Proceedings of this conference are cited in several footnotes and available from IAWF, P.O. Box 328, Fairfield, WA 99012.

[14] An excellent example by Nancy Rencken appears in the "Near Hits" feature of Wildfire, Volume 6, Number 4, August 1997.

In one sense, the question is moot: current Federal law already grants Federal, state, and private employees the right to refuse unsafe work assignments. Federal wildland firefighting policy further states that "Every firefighter has a right to a safe assignment, every fire, every time," but that leaves a great deal open to interpretation and leaves many questions unanswered.

Firefighting is a hazardous business by its very nature and cannot be made risk free. Many suggest that collaborative approaches to leadership and communication, including those embodied by Crew Resource Management (CRM), could largely supplant the need to refuse an assignment. Thus, although the goal stands as stated below, the real question is to what extent and how should it be presented and fostered.

Goal 7. An individual or Crew Supervisor should have the right of refusal to pull themselves or their crew out of what they perceive as undue danger.

Implementation Strategy 1 – Train firefighters on the process to use, not just the right.

The agencies should revise their training materials to ensure that the right to refuse an unsafe assignment is discussed in S-110 (Basic Fire Suppression Orientation), S-130 (Firefighter Training) and S-201 (Supervisory Concepts and Techniques). This should be part of the revised Firefighters Code of Conduct, and also considered an element of being a professional firefighter.

New firefighters must be trained to communicate their safety concerns to their colleagues and supervisors routinely and assertively.

We also recommend adding a one to two hour introduction to the concepts of risk analysis/ risk management at the firefighter level, and expand the concept throughout the training curriculum. Jim Cook of the Boise Interagency Hotshots has developed a risk management concept which is incorporated into S-339 (Division/Group Supervisor) and will also be a part of the new Fatality Fire Case Studies.[15] Fireline supervisors must be taught to accept this interaction as a firefighter's professional right and obligation. The

[15] J. Cook, "Fire Environment Size-up – Human Limitations versus Superhuman Expectations" Wildfire, December 1995, 49-53.

agencies must train their fireline supervisors to listen and foster openness by allowing crew members to present alternative views without criticism.

In most situations, having a dialogue will prevent any precipitous withdrawals. Before any action is taken on one's own (unless it is an immediate emergency), the employee should discuss his or her concern with the next level supervisor, who may explain why the danger is not as great as they perceive, or how it is to be mitigated. If the next level supervisor does not concur with the employee, the employee should have the right and obligation to go one or more level up the organization (time permitting).

It would be far more desirable for the wildland fire community to approach these and other sensitive issues in a collaborative spirit than in a confrontational, "my right versus your right" environment. But there needs to be a formal approach (such as the above) when simple good will and collaborative efforts fail.

Wildland firefighting is not the same as a military situation. In the final analysis, one cannot be ordered to stay in place, even if it means losing the line. One also does not have a right to be a firefighter, nor to be paid if one does not work. Judgment will be needed by policy makers, human resources departments, and by the law as to what constitutes reasonable safety behavior. The culture has to reflect the fact that it is a civilian operation and not a military organization.

Crew Supervisors have the right to refuse assignments that they think are beyond the capabilities of their crew or that would endanger their crews unduly. Refusal to undertake fireline assignment generally should be based on a violation, without adequate mitigation, of the established safe practices, procedures, or standards (e.g., the 10 standard orders, standards for downhill line construction, etc.). Further definition of criteria for a refusal could be developed by a panel(s) of firefighters and by examining examples on either side of the refusal decision boundary, and case studies to point out gray areas.

Implementation Strategy 2 – Monitor frequency of refusals.

A key question is how often refusals of assignments would occur, and whether they would endanger othe If a crew refuses to dig a portion of a fireline and there is no substitute crew, that hole in the line could endanger adjacent crews. If an individual with a

key skill (e.g. a bulldozer operator) refuses to continue work, that too can endanger others.

Also, how often can someone refuse assignments and still be considered a firefighter? In the extreme, suppose someone always refuses an assignment, should they still be paid? Further thought is needed on how to allow people the right to refuse an assignment without leading to anarchy or ridiculous situations where masses of people refuse work but are required to be paid. However, these fears may prove groundless.

Further, setting a new goal or practice in place does not mean it is unchangeable forever. There should be monitoring of how often people are quitting the line, refusing to take an assignment for their crews, etc. That feedback can be used to regulate the practice. If it is rare that out and out refusals occur, and they seem to be in reasonable situations, the new rule can be tolerated; otherwise, it would need to be revisited or reformulated.

Implementation Strategy 3 – Head off situations in which refusals are necessary.

Supplant the need to refuse unsafe assignments by restoring trust in the Incident Management Team. Allow people flexibility in achieving assigned tasks, based on risk management and knowledge of the detailed, changing conditions that the planners may not be aware of. Encourage feedback up the chain of command. Carrying out the strategies and achieving the goals related to supervisor training and experience contained elsewhere in this report will make great strides toward resolving this issue, especially the emphasis on having a dialogue and allowing people to point out situations they consider unsafe. Other related changes in the culture that are discussed elsewhere in this report include:

- Defining the professional work ethic wanted by the agencies, and systematically infusing the organizations with that work ethic through training, leadership, supervision, and effective organization.
- Fostering and teaching a concept of professionalism that includes intolerance for unsafe work practices and empowerment to allow people to influence their working conditions without acting against the goals of the organization.
- Holding people accountable for safety requirements and creating instruments to improve accountability by incorporating responsibility for safety into new

and revised Performance Task Books and integrated fireline performance evaluations.

- Initiating and fostering an operational culture that employs relevant "Crew Resource Management" (CRM) concepts, and training fire personnel to operate using those concepts. CRM addresses the human components of operations, including communication, decision making, leadership, situational leadership, and barriers to these processes. The goal of CRM training is to improve the crew effectiveness (including safety), and reduce the occurrence of error. Therefore, CRM-type training can assist firefighters to understand and apply communication strategies in "right-of-refusal" situations. CRM is one of many tools that the agencies should include in a comprehensive strategy to change organizational culture, and is discussed at length later in this chapter and in Chapter 6 of this report.

Taking Individual Responsibility – Ultimately, one has to be accountable for one's own safety. While the wildland firefighting system is very concerned about the safety of firefighters, the individual firefighter cannot depend entirely on the organization for his or her own safety. Individuals have a professional responsibility to stay alert and watch out for their own safety.

Reports from the field criticize continued departures from accepted safe practices. However, the agencies should not expect willing compliance with all safety directives from lower-level employees who have had little input to the safety policies of their organizations. New safety policies will only become *effective* policy when they produce the behavior the agencies want from people on the line. However, to manifest itself as behavior on the fireline, the comprehensive safety approach of the agencies must enjoy a widespread field support, and that in turn requires widespread, systemic, and influential employee participation. Any leader hoping to influence the safety of firefighters in these agencies must recognize how important it is to gain the commitment of employees at all organizational levels, but especially the lower-level employees, by requiring employee involvement in setting safety policy. (In a sense, this study contributes to that because it brings the concerns and perception of over 1,000 firefighters to the analysis.) The above concerns lead to the following goal:

Goal 8. Foster a sense of individual responsibility for safety actions.

Most of what is needed to achieve this goal has already been discussed or will be discussed under other goals. The agencies will foster a sense of individual responsibility for safety actions if the strategies are pursued for situational awareness, accountability, and professionalism, under Goals 2, 4, 6, 8, 9, 41, 58, and 59. Fostering a build-up of experience also will allow build-up of personal skills. Additionally, the following implementation strategies are recommended.

Implementation Strategy 1 – Include in the "Code of Conduct" that all employees are responsible for adhering to safe practices and correcting violations.

Goal 2 dealt with establishing in a Code of Conduct that employees had the right and responsibility to report problems and contribute ideas and solutions. Going further, the "Code of Conduct" and the organizational culture should expect Agency Administrators, managers, and employees to adhere to established safe practices, and have the right and responsibility to intervene and correct safety problems. This is part of the oversight responsibility of everyone from first level supervision on up. Non-supervisory employees do not have authority to direct others, but they should feel obliged to point out problems they see. The methods for promoting the "code of conduct" were already described in Goal 2.

Implementation Strategy 2 – Discuss the issue of responsibility in initial training and in refresher training.

In addition to forthrightly teaching the philosophy that there are many details all firefighters must attend to themselves to be safe, some of the specifics of what to do should be mentioned. And training should emphasize that safety reminders are part of every assignment, not just training situations. In addition to following prescribed procedures, using protective equipment, and staying physically fit, personal responsibility at the most basic level includes care with tools, keeping an eye out for snags or falling rocks and other debris, foot placement on rough terrain, and recognizing signs of fatigue. There is also personal responsibility to know the location of safety zones and escape routes, and to pay attention to weather and shifting fire behavior. If they are not pointed out the firefighter needs to ask about them. The objective is not to question the knowledge of leadership, but rather to broaden the team effort to assure both individual safety and the safety of the crew.

Implementation Strategy 3 – Disseminate examples and stories of successful individual initiatives.

Videotapes showing "model" individual firefighters attending to safety details should be added to training if not already included in existing materials. Anonymous stories about individuals who were injured because they did not pay attention (e.g., were not alert to falling snags, or watching where they were walking) should also be spread.

Safety for All Firefighters at Federal Fires

Anyone working at a "Federal workplace," including incident bases and the fireline, should operate under the same safety philosophies (unless some non-Federal law supersedes). Safety goals and rules should apply to all firefighters working on a Federally controlled wildland fire, including firefighters from state and local government and inmate, military, and contract crews safety must be the same for firefighters regardless of ethnic group or gender.

Non-Federal Firefighters – In our interviews and survey, Federal firefighters raised as much or more concern about the safety of non-Federal firefighters, especially local volunteers, as they did about Federal firefighters. It is difficult for Federal agencies to directly influence the organizational culture of the non-Federal firefighters, but the Federal culture can promote watching out for the welfare and safety of those who help the Federal firefighters.

Application of safety standards should also be done in compliance with Federal Equal Employment Opportunity laws protecting against discrimination, whether the employees work for Federal or non-Federal agencies.

The above considerations led to the following goal:

Goal 9. The safety goals and rules should apply to all firefighters working at a wildland fire which is a Federal worksite.

Implementation Strategy 1 – Require, encourage, and assist non-Federal agencies to comply with safety precautions.

Many non-Federal firefighters will not have received the training, information, or experience necessary to function as described in this report. However, the cultural change envisioned by this report requires widespread acceptance and change across the interagency spectrum. Non-Federal firefighters must be expected to comply with the norms required of the Federal firefighters when fighting Federally controlled wildfires. The Federal agencies can (and do) set rules for contract, inmate, and military crews. While not setting rules for local firefighters, the Federal agencies can turn away local firefighters if they are not properly equipped (e.g., with protective clothing and radios).

Organizations supplying non-Federal firefighters and the firefighters themselves (e.g., EFFs) should be informed of safety requirements ahead of time. Inquiries can be made as part of the call-up of local, state, and other non-Federal resources as to their having the appropriate equipment. Only qualified, properly equipped firefighters are supposed to be mobilized to Federal incidents, but it was widely reported in Phase I that that requirement often was not met, and not checked. The final review is at check-in at a fire.

In some cases, Federal lands are protected only by local firefighters, and their equipment may never be seen. That situation might be handled by written agreement in arranging for coverage of an area. (Any existing written agreement needs to be reviewed to see if it requires meeting reasonable local or Federal safety standards.) The Federal agencies should not tacitly accept poorly equipped or trained local firefighters doing the Federal job to save money.

The agencies should encourage the NWCG to continue planning a comprehensive approach to fireline safety policy that is shared across the spectrum of the wildland fire community – including state and local governments. NWCG standards are not mandatory, but the use of standards should be encouraged for all.

Implementation Strategy 2 – Provide (or facilitate obtaining) training and equipment for non-Federal firefighters who assist.

Provide Federal aid to local government and volunteer fire departments as they expand their wildland fire responsibilities on and near Federal lands, as called for by the Federal fire policy review. Disseminate new standards. Help facilitate or conduct training of non-Federal wildland firefighter leaders and trainers.

Provide, through property loans, payroll deduction, or contract adjustments, essential safety equipment so that non-Federal firefighters do not arrive without proper equipment (or find some way to loan them equipment if they arrive with some deficiencies). Another alternative is to send back any individuals or units who are not properly equipped.

Equity Considerations – All goals and implementation strategies outlined in this report apply to the entire Federal wildland firefighting force and their cooperators regardless of race, gender, ethnicity, or employment status. The intent is to assure a positive work and rest climate free of distractions caused by harassment, intimidation, or discrimination. Though some problems of discrimination and harassment exist, Phase I of this study uncovered remarkable consensus across ethnic and gender groups on almost all safety issues.[16] The goals for safety are the same for all members of the wildland firefighting community. However, special efforts may be required to get all groups and individuals to achieve the goals.

Goal 2, which sets a code of conduct encouraging firefighters to speak up, directly addressed one of the prime equity issues – reluctance of some women and minorities to speak up on safety issues for fear of being further discriminated against or poorly thought of rather than have a separate goal for women and minorities, Goal 2 should be applied to all types of firefighters. In addition is the following goal:

Goal 10. The rights and responsibilities of wildland firefighters should apply to all, regardless of race, gender, ethnic affiliation, or employment status.

Implementation Strategy 1 – Ensure that all of the recommendations here are applied uniformly for all types of firefighters.

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[16] Appendix B of the Phase II Report shows how sub-groupings of wildland firefighters felt about various recommendations for improving safety. The sub-groupings include age, ethnic groups, and gender.

There must be no discrimination with respect to any safety issue. We did not hear of any equity issues *related to safety* other than regarding radio distribution, reticence to speak up, and fast-tracking. There are equity problems, but they do not seem primarily safety issues – at least as related by the women, minorities, and other firefighters we heard from. The recommendation here is basically to remain vigilant and open to any special issues that may emerge, and to be even-handed in applying training and other suggested improvements.

Implementation Strategy 2 – Ensure equitable equipping and treatment of Type II crews.

Apart from some gender issues, most of the discrimination voiced in Phase I dealt with some Type II crews that were comprised mostly or entirely of minorities. The agencies should reaffirm that Type II crews are the foot soldiers of the interagency firefighting effort, and a mainstay of the system. Extra effort should be made to properly equip and train all Type II crews to meet the objectives of the goals and strategies outlined in this report.

Implementation Strategy 3 – Provide opportunities for verbal communications training.

The language of some minorities presents a barrier to firefighter safety and effectiveness, and to their ability to get promoted. Some ethnic firefighters need help with language skills, especially to prepare them for leadership positions. As demographics changes, the numbers needing help may increase.

Rebuilding Experience Levels

The people interviewed and surveyed during Phase I of this project, and many senior fire program managers, raised major concerns about the decreasing fire experience in the agencies' workforce. They are most concerned about the impact that this loss of experience has on judgment and decision making under the stress of the fireline environment, and thus on safety. In addition, the pool of Federal employees who are willing and available to fight fire is shrinking, due to several factors: There are fewer Federal employees, and the agencies have lost a great deal of fire experience through downsizing and early retirements. Some people with experience in the fire program have

dropped out from lack of motivation or disenchantment. As budgets and workforces shrink and missions become more complex, agency managers are less willing to release collateral duty firefighters from their primary responsibilities to take fire assignments. Finally, the composition of the agencies' workforces has changed. Many employees have little personal or professional interest in fire, and thus fewer people are making themselves available for fire duty.

A competent, experienced workforce is a basic underpinning of safe and efficient organizations. However, the agencies are not replacing the experience of seasoned Federal wildland firefighters as they retire or withdraw from the workforce with equal numbers of well-qualified people. This impact is magnified by a system that chooses its managers and critical decision-makers from a permanent workforce where fewer and fewer people have a solid fire management grounding. Consequently, the agencies have, of necessity, put some inexperienced people in the position of making critical strategic and tactical choices and decisions on the fireline. The implications to firefighter safety are enormous. The agencies need a process to ensure that adequate numbers of trainees are in the pipeline and gaining experience to meet future needs, and to achieve the following goal:

Goal 11. Adequate experience levels are needed for Crew Supervisors and higher positions. There is a minimum cadre of experienced personnel needed for each supervisory level of the fire program.

Implementation Strategy 1 – Periodically develop strategic assessments of personnel needs.

A strategic assessment is needed at the fire program level to determine the minimum resources needed to safely and effectively fight fire. This information needs to be available at the national level. It can be built up from assessments at each organizational unit, including existing and desired staffing levels. There must not be double counting of needs or resources (i.e., two units listing the same resource). The flow should be from individual agency units to zone dispatch offices to area dispatch office to the national level. This is current policy but not totally implemented. Some areas do it and others do not.

The approach to periodically develop a personnel resource needs assessment should be computerized. The NPS developed a concept for such an approach for the

Department of Interior, the Shared Application Computer System (SACS), but it was not accepted at the time by the other DOI agencies, nor was it completed. That can be a starting point for developing an interagency tool, or at least serving as an example to stimulate further thinking.[17]

Implementation Strategy 2 – Track experience levels.

At present, dispatchers know the resources they can tap. The number of people available for various positions in firefighting and fire management is known approximately, and each level has a minimum requirement nationally. However, their experience level is not known and there did not seem to be confidence in the data on the total number qualified at each position.[18] Much of the workforce could be new at their position and that would not be known. The number of fire seasons in which one was active for at least one fire (or, more preferably, the number of fires one has fought) would be a desirable measure of experience levels. The number of people qualified for each position should continue to be monitored. Based on this, and the strategic assessment of personnel needs, the number of people in the training and certification pipeline should be adjusted to build up experience levels.

Implementation Strategy 3 – Establish an Apprenticeship Program.

All five agencies should collaborate to establish a "Fire Management Apprenticeship Program," combining elements of the Joint Apprenticeship I & II (JAC) program of the Forest Service and the National Park Service's Crew Supervisor Academy into a new "Fire Management Apprenticeship Program." The intent is to continuously develop a professional cadre of crew superintendents, trainers, supervisors, Fire Management Officers, etc. who are technically qualified and able to provide competent fire program leadership.[19]

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[17] Under development is the Resource Ordering and Station System (ROSS), which will show status and availability of qualified resources. This may be the way to provide the necessary data on existing positions. This NWCG project is planned to be available for the 1999 fire season.

[18] When we did the survey in Phase I the agencies were not able to tell us how many people there were at each level (firefighter, Crew Supervisor, division supervisor, etc.). That information may exist, but it was not readily available. We assembled a database that went far toward doing this; it is now held by the International Association of Wildfire.

[19] Note that FMO positions require college training; an Apprentice would have to obtain that training or already have it to quality for an FMO job.

Benefits of this approach include:

- Establishment of a base-level of professional expertise.
- Appropriate training and mentoring from a topnotch training cadre.
- Training and education coupled with practical experience.
- Graduates who are observed, measured, tested, and the products of a respected training curriculum and staff (known quantities).
- Educational support and accreditation through formal relationship with a community college (which also enables graduates to combine an apprenticeship program with degree programs).
- An opportunity to retrain "the downsized" for opportunities in fire suppression and prescribed fire roles, and perform effectively in them.

The *interagency* apprenticeship program would have at least two paths to entry:

Track 1 would be for existing employees, especially long-term seasonal employees without continuous appointments, who would get a guarantee upon successful completion of the program of an appointment to some position – either permanent part-time, subject to furlough, term appointment, or permanent. (This or a third track might be used for employees affected by downsizing.)

Track 2 would be an apprenticeship hiring program, as the JAC is currently used by the Forest Service in California. Hiring for continuing, entry-level appointments in fire management would be completed through this apprenticeship program (except for FMO positions, as noted in the previous footnote).

The current Forest Service Joint Apprenticeship Program and other current initiatives could serve as a model for an interagency program. The Joint Apprenticeship Program is a Department of Labor certified apprenticeship program. It originated because of a court ordered consent decree requiring the Forest Service to diversify its workforce in its Region 5 (California). In that region, all hiring for continuing appointments in fire management is done through the JAC. The Forest Service apprenticeship confers "Student Coop" status on the participants and requires them to complete over 3,000 hours in the program (2,000+ hours required by Department of Labor as a certified program, with an additional requirement levied by the Forest Service).

The Forest Service's apprenticeship program initially met with resistance due to its origins (the consent decree) and cost. However, many people in the fire management community now recognize that graduates of the apprenticeship program display better basic skills than firefighters who have not participated in the program. About 400-500 Forest Service personnel have completed the program. The Forest Service contracted for their California (JAC) program through a private provider in the past, but beginning this year, the agency will run the program itself, at an estimated one-third the cost of the contract.[20]

The apprenticeship program has five parts:

1. Entry-level Academy (30 days).
2. Approximately 1000 hours of practical experience at a work duty station guided by a training plan.
3. Advanced Academy (30 days).
4. Additional practical experience period at their homework duty station (length depends on hours needed).
5. Guaranteed appointment pending successful performance.

The next (9th) Forest Service Academy is planned to begin in February or March of 1998 and will be run by Region 5, though participants will come from other states/regions. The 10th Academy will be run as a national program under the guidance of a national steering committee. An agreement on national standards for the National Joint Apprenticeship program was reached with the Department of Labor in early 1998. The apprenticeship program will provide 4,000 hours of training and will produce a new position, "senior firefighter" at the GS-5 level. They will be prepared for serving in single resource positions.

Neither the Forest Service's apprenticeship program nor the NPS Crew Supervisor Academy are widespread interagency programs at this time. A few (about 20) BLM personnel and a few BIA and tribal people and others have participated in the Forest

[20] There are some specialized training programs outside the JAC that provide tracking opportunities; e.g., the Technical Fire Management (TFM) program provided through some universities, and the Northern Arizona University training program for fire prevention and use of fire in ecosystem management.

Service program through agreement between the agencies, but there has not been wholesale participation, because of the costs of the program and because it is tailored primarily to Forest Service needs.

The Forest Service has recognized that the apprenticeship program needs to add an intensive leadership and supervision module. The one week curriculum used by the National Park Service in a pilot Crew Supervisor Academy (conducted at the Presidio in San Francisco, 1997) includes leadership and supervision material with potential to provide the basis for this module. This leadership and supervision module also could be the venue for preparing participants as certified On-the-Job Training (OJT) providers (as will be discussed under Goal 14).

The five Federal fire agencies have discussed the need for apprenticeship and academy approaches such as discussed above. Other curriculum suggestions made from within the agencies include adding advanced "specialty" academies (such as the BLM's current two-week "Engine Academy"). This may be particularly useful to fill known resource gaps and alleviate known weaknesses in specialties such as dispatcher, lead plane pilot, and air operations. However, the agencies must place a priority on first establishing an interagency program that produces a core staff possessing essential technical and leadership skills, allowing the program to evolve from there. The Forest Service apprenticeship program is associated with a community college that confers accreditation, allows participants to combine the apprenticeship program with degree programs, and allows participants to qualify for positions under the Federal job series classification for natural resources.

For practical reasons, an interagency fire management apprenticeship program must be phased-in. Some agencies have funding and staffing limitations that may initially preclude their involvement. An interagency needs analysis would have to be completed to determine the demand for participation and to set targets for a scheduled, but rapid phase-in of the program. The phase-in could begin by combining the elements of the Forest Service JAC program and the leadership aspects of the National Park Service Crew Supervisor Academy.

The current Forest Service JAC academy location is in Southern California in the Los Padres National Forest. Ultimately, academies may need to be held more than once per year and at more than one location. However, recognizing that the concept requires

academy attendance during the winter months to avoid fire season conflicts is important, and requires warm climate location(s). National Park Service facilities at Golden Gate National Recreation Area (San Francisco) have also been suggested as a potential good location. The NPS Crew Supervisor Academy is there, and the location reportedly includes on-site accommodations and eating facilities and excellent cost-effective airline access. Apparently the Fire Management Officer there is very supportive of the idea of expanding the role of this program and of interagency cooperation. At a minimum, the "leadership and supervision" part of the program might be conducted there.

Another important consideration in establishing a fire management apprenticeship program is that it be done without creating a "fire department" subculture within cross-functional *natural resource management* agencies. The agencies will need to establish how they will achieve the aims of the apprenticeship program without alienating collateral duty and seasonal firefighters on whom the agencies have become so dependent. One approach would be to encourage "space available" participation by employees whose primary duties lie outside the fire discipline (non-fire dedicated positions). However, meeting the fire-related practical experience requirements of a certified apprenticeship program would be difficult for those not engaged in fire management full time.

Ideally, the apprenticeship program would take a tiered approach, recognizing that the apprenticeship program could serve three allied purposes:

- To establish a core professional cadre of wildland fire specialists and provide a dedicated fire career ladder.
- To enhance the careers of professionals whose primary duties lie outside the fire discipline (non-fire dedicated positions) through fire training.
- To enhance the fire program and improve agency-wide participation in the fire program by providing fire training/qualifications to professionals whose primary duties are outside the fire discipline (non-fire dedicated positions).

If people have either primary responsibilities or significant collateral duties in fire management, then they would enter the job through the apprenticeship program regardless of their job classification.

An apprenticeship program will provide great benefit to the professional development of people holding dedicated fire positions. However, it will not be available to seasonal and temporary employees without continuing appointments, and cannot be expected to accommodate all of the employees who contribute to the fire program as a collateral duty. *Therefore, it does not replace the need for an effective performance-based training system.* The agencies must assure that the existence of an apprenticeship program does not water down the performance-based training program by making excessive demands on qualified trainers, training developers, training and travel budgets, and other resources at the expense of "non-apprenticeship" training programs.

This strategy supports other strategic goals outlined in this report, including Goals 14, 42, 43, 44, 59.

Implementation Strategy 4 – Revise requirement for currency of certification.

The agencies should reconsider their approach to currency requirements and currency re-certification, and do the following:

- Require three-year currencies for operations and command positions (instead of the five years at present). Not having done anything for five years and then being thrust into critical fireline decisions seems way too long.
- Devise better extension/currency re-certification mechanisms for people whose qualifications have lapsed. Simulation, shadowing, apprenticeship, and other forms of on-the-job training all merit consideration for greatly expanded use. Multiple approaches for maintaining or restoring currency should be allowed. A rigid (experience only) approach has deterred people from maintaining or refreshing their qualifications, and the agencies need to consider whether that is desirable. If there were enough people with fresh credentials and adequate experience the point would be moot, but that is not the case.

Implementation Strategy 5 – Increase the use of special assignments to build experience.

The agencies currently use a performance-based training and qualification system. The on-the-job aspect of that system may be misunderstood and underutilized as a tool to accomplish the aim of ensuring that adequate numbers of trainees are in the pipeline and gaining experience to meet future needs. To implement this feature of the system

effectively, the NWCG should clarify use of training and evaluation assignments, and expand their use.

Two types of assignments exist, a "Training Assignment" (to conduct on-the-job training), and an "Evaluation Assignment" (for evaluating trainees on their performance as required for completion of a Position Task Book). To expand the use of these assignments, a guideline such as the following should be established: on a given fire, about 5 percent of assigned personnel should be people on Training and Evaluation assignments (split roughly 50-50). For it to succeed, the coordination and dispatching system must understand and implement this concept, as must line managers in home units. The agencies also need a process for making sure that people who get training then receive timely experience and evaluation assignments, meet requirements quickly and become qualified. The Forest Service and Bureau of Land Management are currently working on an "allocation of resources" or draw-down strategy that identifies individual people available for fire assignments ahead of the fire season. Region six (Washington and Oregon) of the Forest Service already employs such a scheme. One by-product is that qualified individuals (those who have received the training) are identified and obligated to be available for fire assignments. These efforts should be continued and broadened to all agencies.

Implementation Strategy 6 – Encourage more participation from non-fire personnel.

The agencies should develop and fund recruitment, retention, and career development strategies that get more of their "non-fire" personnel participating in incident and prescribed fire operations and support. The problem of how to do this is complex. Many people can be trained, but few accept assignments, for many reasons.

Work often piles up while an employee is on a fire assignment, resulting in displeased supervisors and overloads on colleagues and on the returning employee. A simple, "quick-call" system needs to be developed at the unit level to help find temporary fill-ins for the employee. Important support to an emergency does not have to be at the incident, but rather can involve filling in at the workplace to allow someone else to go to the incident. In an era when electronic office and communication tools are available, it does not seem that strategies for "fill-in" or "back-up" work management should be a major impediment.

Budget and personnel staff need to develop performance and evaluation standards that do not penalize employees who work at an emergency assignment and do not meet targeted goals back in their home unit. To the contrary: unit managers need to be held accountable if they do not release qualified firefighters and do not try to arrange fill-ins. Everyone has to do his or her share.

Personnel Practices for Retaining Experience – People who participated in the Phase I interviews and survey suggested more ideas for improving personnel practices than for any other area. While many of the ideas do not seem related to safety on the surface, they are needed to retain experienced personnel, especially candidates for promotion, and that expertise is definitely related to safety.

A number of changes are needed in personnel practices. The agencies must especially consider changing their approaches to rewarding and recognizing the most experienced and valuable of the collateral duty and seasonal firefighters. Currently, disincentives discourage people from returning season after season, thereby impeding the agencies' ability to build and retain experience in the workforce.

The agencies also have had difficulty retaining some experienced collateral duty personnel in the fire programs. These employees are reluctant to leave their non-fire jobs when they have supervisory pressure not to volunteer, pay and work disincentives, and a lack of rewards and appreciation. Progressive personnel practices are key to employee retention.

At present there are few pay incentives for permanent employees to take on collateral fire duties. Their own work stacks up, causing more workload and pressure when they return. Their managers end up sacrificing overtime pay from tight budgets.

In addition, pay rates for fire responsibilities taken on by supervisory or management employees is a further disincentive. Not only are they not sufficiently rewarded for the hardships of fire duty, but in some ways they are actually penalized financially. Consequently, many employees are now thinking, "Why spend the time and effort to get more credentials and qualified experience only to get less pay for being away from home and my regular work?"

More and more permanent employees with fire qualifications and experience are dodging fire assignments, at all levels of the fire management organization, from firefighter to manager. Consequently, the fire program increasingly will have to rely on less experienced people's judgments on the fireline if retention is not improved, which leads to Goal 12.

Goal 12. Encourage the retention of permanent employees on fire duty.

Implementation Strategy 1– Remove pay caps for overtime on fires.

There currently are pay caps on overtime for employees exempt from FLSA overtime requirements. Exempt employees earn overtime at time-and-a-half of a GS-10, Step 1, instead of time-and-a-half of their pay rate. This leads to situations in which exempt employees in Incident Management Team positions (e.g., IC) earn less than someone delivering supplies in a pick-up truck. If the objective is to limit pay to an individual, one could set a ceiling on the number of overtime hours and send them home when they reach it. However, it would be much better if the agencies could remove the pay caps and pay overtime at time-and-one-half of their salary when employees serve on fire duty regardless of the number of hours worked or dollars earned.

This change may require an Act of Congress. An appeal has been submitted by the agencies to OPM to see if an administrative waiver can be obtained or legislation suggested.

Implementation Strategy 2 – Consider expanding use of special pay and retirement incentives for collateral duty personnel.

Some personnel receive an extra 25 percent for hazardous duty if they go to the fireline, but many working on the fire do not get it.

The agencies should consider broadening the pay incentives and providing a retirement incentive for fire duty performed by permanent employees. For example, an extra bonus of 20 percent of every hour spent on fire assignment might be added to a permanent employee's tenure at retirement time. Under this scenario, for every 40 hours spent on actual fire duty (including support functions charged to specific fires) an employee would earn 48 hours of service time (an extra 8 hours.) Note that the Federal firefighter retirement system already gives full-time firefighters an earlier retirement benefit than other employees, though they also contribute more to retirement than regular

employees. The proposed benefit would apply to all personnel in wildland fire positions, without extra contributions by them. Legislation may be needed to change the pay or benefits.

Implementation Strategy 3 – Increase expectations for employee participation in fire programs.

The agencies and their employees should expect that all permanent employees will participate in fire activity unless such participation creates a personal hardship or is limited by disability. Hardship examples might include single parents with young children, children sick at home or similar reasons for not being away from home for three weeks. The agencies should require supervisors to encourage and not discourage participation in fire duties by their employees. Even though agency directors place priority on this, it does not always happen. Supervisors that discourage permanent employees from taking on fire responsibilities should expect a negative report on the Supervisory Responsibilities element at evaluation time. Supervisors should be prohibited from receiving an outstanding rating in the Supervisory Responsibilities element if they discourage any employee from fire duty.

Implementation Strategy 4 – Evaluate employees' willingness to participate in fire programs.

Permanent employees should have an evaluation element that addresses their willingness and ability to take on fire responsibilities. The fire program has a wide variety of personnel needs and there are few, if any, employees who couldn't contribute to the effort in some way. Non-fireline qualified employees can staff administrative or support functions at the fire or in office settings. Fire responsibilities can be rotated so that offices continue to function and the public is served. In this way, everyone shares in the responsibility of keeping offices functioning and contributing to fire management functions.

Goal 13. Encourage retention of seasonals on fire duty.

Implementation Strategy 1 – Re-examine personnel policies that inhibit retention of seasonals.

By implementing goals and strategies found throughout this report, the agencies will improve their retention of seasonal employees because they will be members of a

better trained, more empowered, safer, high performance firefighting community with a positive professional image.

In addition, the agencies should evaluate the personnel policies, terms of employment, pay classifications, and pay scales for seasonal fire management employees with an eye toward enhancing their retention. Pay disincentives should be removed and a method of providing pay incentives implemented so that raises may be provided in recognition of increasing experience and qualification as appropriate. Artificial constraints imposed via limitations on terms (length) of employment should also be abandoned.

Some seasonals should not and will not be asked to return, and that should be made clear, too. Likewise, the seasonals should be told about the chances for promotion.

A study is needed to help set standards for the percent of crew membership that should be seasonal versus permanent to perform well. The feeling from the experts consulted in this study was that the cadre of permanent firefighters needed to be increased, as was discussed in Goal 59. Of course this would require additional funding. To be cost effective, these firefighters could be assigned non-fire duties to fill slack time off-season. However, as use of prescribed fire increases, they would have a growing fire-related workload, and may have little slack time.

Training to Accelerate Experience – Aviation, medicine, law enforcement, the military, and industrial settings clearly show that experience can be effectively augmented by training and that certain types of training convincingly replace some experience requirements. Training can expand the experience base and build up the expertise of the trainees. The agencies currently rely on a system that requires them to wait for five or ten years while people accumulate more and more experiences. Various types of training can expedite this process, speeding trainees along the learning curve.

This is not to say that the "S," "I" and "RX" curricula as currently structured can effectively or safely replace experience. To replace fireline experience, training must be highly realistic, interactive, and challenge people to apply decision-making skills under stressful conditions.

Direct experience in wildland firefighting takes a long time to accumulate and carries with it many risks. The very nature of the firefighting job is to work in proximity to danger, and firefighting cannot be made risk-free. That is why the agencies must find

ways to expand the experience base and accelerate the rate at which trainees build up experience.

A particularly important link is the Crew Supervisor, who arguably has the most influence on firefighter safety. Crew Supervisors must recognize and understand what is an acceptable level of risk. If their tolerance for risk is too low and they withdraw at the slightest sign of danger, they cannot effectively perform their job. Conversely, if they accept too many risks, they may needlessly put their crews into harm's way. Fire personnel cannot learn the edges of the risk envelope if they are not gaining the opportunity to experience these edges while they work close to danger. Therefore, the gradual accumulation of experience is likely to be slow because these opportunities will (hopefully) be limited. Relatively few firefighters have been in critical situations such as blowup conditions or a shelter deployment, so most do not accumulate these experiences first hand. That is another reason why it is so important to speed up the learning curve by means other than direct experience.

We can try to present rules, including the existing rules and guidelines such as LCES, the Standard Orders, 18 Watch Outs, and Downhill Guidelines to help firefighters react to risks. But, as discussed elsewhere in this report, prescriptive rules are not adequate, on their own, to ensure safety. Each rule is itself a compilation of experience, and depends on experience in order to know how to interpret it.

On-the-Job Training. There exists a separation between training and operations in the organizational mindset. Though people are accruing most of their skills in the operational environment, many Crew Supervisors and squad bosses do not seem to consider fire operations as training opportunities. On-the-job training (OJT) represents a significant opportunity for replacing actual or full fireline performance with training. OJT is part of the current performance-based qualification system, but is profoundly underutilized. A comprehensive On-the Job Training strategy is presented under Goal 71, described further in Appendix B.

Simulation. Simulations and simulators can replace some experience and facilitate hands-on exercises that recreate real situations without danger or the need to go to the field. Simulations are used effectively to train military and commercial pilots, police officers, emergency room and surgical medical teams, ships' officers, ground-based and shipboard firefighters and industrial and manufacturing workers. Properly designed and

conducted, simulations are stimulating, effective, fun, adaptable – and in some cases – portable.

Evidence shows that simulation improves safety and allows people to learn to cope with dangerous, even life threatening situations in a realistic, yet low-risk setting. Simulator training is not constrained by safety, environmental, or other physical limitations. For example, astronauts trained for landings on the moon used simulators, and could repeatedly crash! This is a high profile example of training successfully replacing experience, since preparing in the actual operational environment was not possible. According to the FAA, the state of the art is such that simulator training alone qualifies a commercial pilot to fly a new type of aircraft. Pilots also can complete conversion training and recurrent training in a simulator. A pilot of one aircraft type can cross-train to another in a simulator, and then carry fare-paying passengers the first time he or she flies the new aircraft.

The Defense Science Board concluded that computer-based, simulated scenarios offer the only practical and affordable means to improve the training of military service operational commanders, their staffs, and the people who report to them (Defense Science Board, 1988). The military has made an enormous investment in the technology necessary to maintain a credible simulation training program. Military personnel do not get the opportunity to fight as many "battles" as do wildland fire personnel, so they must stress simulation more, but it is still a tool that can be used much more than it is for fire managers.

Training As a Substitute for Experience. Because the agencies have lost a great deal of tactical experience, less seasoned people must make critical tactical and strategic decisions on the fireline with enormous firefighter safety implications. For that reason, the agencies must enhance the current system of strategic and tactical training, and in particular to replace the experience lost in the ranks of Type 3 and Type 4 Incident Commanders, and in Division Supervisors.

Below is a description of strategies for developing training that can directly impact the safety of wildland firefighters, including simulation platforms for delivering training. These strategies advocate a balanced approach to making training more realistic by employing alternative training methodologies, including advanced training technologies,

"low fidelity" technology (e.g., simulations, paper-and-pencil exercises) and on-the-job training.

Goal 14. Develop ways to use training of various types to compensate for lack of experience.

In addition to the strategies below, the Implementation Strategy to increase use of an interagency fire management apprenticeship program discussed under Goal 11 is relevant.

Implementation Strategy 1 – Expand use of on-the-job training; train people on how to do it.

The agencies should establish a formal OJT program to augment the classroom teaching and experience requirements of the performance-based training system. OJT opportunities include non-incident settings such as prescribed fire assignments and project work, as well as at incidents. The NWCG should clarify, emphasize and encourage the use of OJT as envisioned in the performance-based training and qualifications system.

Considerable research has been done on how to teach OJT. Klein and Associates (a part of our project team) have catalogued 57 OJT instructional techniques, as part of their research on OJT for the military, private sector, and fire departments. The reader is referred to Goal 71 and Appendix B for details of how to improve OJT.

Implementation Strategy 2 – Enhance course training in strategy and tactics.

The agencies should enhance training in *strategy and tactics*, particularly for Incident Commanders Type 3 & 4, by making further improvements to the content of the required courses. There already has been progress. The new S-131 course (Advanced Firefighter Training) is right on target. It appears to be very well developed and partially fills an important gap in the fire suppression training curricula created when the agencies made the transition to ICS in the early 1980s. The course is designed to emphasize basic tactics, strategy, and safety for Advanced Firefighters and Squad Bosses and to serve as a prerequisite for Incident Commander Type 5. The course materials emphasize safety, introduce a risk management approach, and include good application of the available fireline tactical and safety references and job aids. Those references and aids include the

Fireline Handbook, the "Look Up, Look Down, Look Around" materials, LCES, and others.[21]

S-131 includes good training opportunities through scenario-based exercises (Unit 4). These scenarios represent a positive and effective instructional approach. They are also opportunities for future use of simulation-based training that would be even more realistic and effective. The S-200 (Initial Attack Incident Commander-ICT 4) and S-300 series (Incident Commander, Multiple Resources Extended Attack – ICT 3) courses also effectively address tactics. However, additional emphasis on strategy and tactics training is needed to enhance the performance of Incident Commanders Types 3 and 4, Crew Supervisors, and Strike Team/Task Force Leaders. The agencies must take care to assure that they are building strategy and tactics training continuously, consistently and *comprehensively* throughout the suppression curriculum.

Implementation Strategy 3 – Develop a family of simulators and other instructional technology.

The agencies have been using simulation in courses at the 300, 400, and 500 level, but the instructional/training technology lags behind that used in many industries and government agencies today. They are experimenting with, but not yet systematically using, simulators, but there is little use of interactive and multimedia technology.[22] Computer-based simulation technology has been in routine use in the military, airlines, and other industries for more than 20 years. The military, the airlines, manufacturing companies, and others who use simulation extensively are well on their way to moving beyond computer and video simulation to training in "synthetic environments" (virtual reality).

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[21] Interestingly, the plethora of safety guidelines contained in the S-131 course reinforces the opinion expressed in the survey and interviews of Phase I (and by many others) that there are far too many things for firefighters to try to learn and remember. It also reinforces the point of view that the LCES concept has been widely accepted and is here to stay. Because the course is strongly oriented to existing fireline tactical and safety references and job aids, it will be heavily affected by analysis and revision of those references as recommended elsewhere in this report. Once the fireline safety and tactical references have been revised, immediate revision of these course materials should follow, as should a revision of the Fireline Handbook.

[22] Training technology includes Internet-based, telecommunications, distance learning, and open-systems learning options to train employees in the fire curricula. Commercial enterprises are available to adapt training materials into Internet-based packages and administer the training, though this option has not been utilized.

The Alberta, Canada Environmental Training Center (within Alberta Environmental Protection) is currently developing a CD-ROM application of the S-290 Intermediate Fire Behavior Course in conjunction with the National Interagency Fire Center (NIFC) Division of Training. This training package demonstrates the great potential of this technology. Alberta Environmental Protection recently tasked their Environmental Training Center to begin work on firefighter safety applications. The technology would work well for self-paced instruction of many courses currently contained in, or planned for, the (United States) fire management curricula, including ICS training, Fatality Fire Case Studies, Standards for Survival, and S-190. The agencies should encourage the NWCG to expedite its review of this technology, make this course available in the NFES Publications Catalog, and facilitate its use (which requires accessibility to multimedia personal computers at agency field locations).

The agencies must avoid the extremes as they move to modernize their training technology. Waiting for (or developing) the "best," most cost-effective technology will only cause the agencies to fall further behind. Constant changes in technology mean that acquisition of the latest "turnkey" systems will *always* be a moving and expensive target. On the other hand, exciting, cutting-edge, and emerging technologies such as immersive training in synthetic or virtual environments (VE) and Digital Visual Disc CDs are tempting but expensive. State-of-the-art simulators can cost $5 to 20 million. Fortunately, the simulation marketplace is very competitive, driven by the defense and entertainment industries. Cost trends continue downward, as much as 30 percent to 68 percent per year according to some estimates. At that rate, the agencies in 8-10 years will be able to purchase for $10,000 the computing and simulation power of a system that would cost more than $1 million today. Technology in this price range would mean that the agencies surely could, in 10 years, have the close-to-reality simulation capabilities used by the military and airlines today.[23] The capability can be available earlier, depending on the importance given to improved training. The agencies should try to obtain for at least some key courses a simulator even at today's prices.

We recommend that the agencies immediately acquire at least some training simulations in standardized delivery platforms. The agencies can use off-the-shelf technology and PC/video-based simulator systems. The FAA is recommending a similar strategy for non-airline flight simulation.

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[23] Air Power Journal No. 2 (Summer 1995), pps. 27-41.

There are several promising avenues that are, or can be, applied to wildland firefighting training, such as the following:

- *The Multi-Interactive Multimedia Simulator (MIMMS) (Canada).* This is a laser-disk based, multi-person, interactive decision-making training program. The instructor creates simulations by compiling scenarios into carefully designed scripts developed from specific training objectives. The scenarios, are stored on a video laser disk, developed from video footage compressed onto the laser disk. The MIMMS software captures the scenarios through computer icons that can be arranged to allow flexibility in calling up appropriate images at the correct time during the simulation. The simulation unfolds according to the decisions and strategies employed by the trainee(s). To incorporate multi-person interaction, and therefore realism, the MIMMS incorporates role playing of up to eight people using a closed radio system monitored by the instructors.

  This system is in use in several locations in the United States and is being actively promoted by the U.S. Forest Service's San Dimas Technology Development Center. However, due to the decentralized nature of the Forest Service, awareness and acceptance in the training and field communities remains low. Its cost is approximately $50,000 per unit.

- The Federal Emergency Management Agency (FEMA) and the National Fire Academy (NFA) have developed, and use, a simulator housed at the NFA.
- The U.S. Navy has developed advanced simulation on shipboard firefighting.
- The NIFC Division of Training is working in this area and the Bureau of Indian Affairs is working on a fire growth model for initial attack training that is CD-ROM based (through NIFC Division of Training.)

Virtual reality technology offers great promise and is where simulator technology is headed. However, Virtual Environment (VE) training represents a "quantum leap" for the five agencies at this time. Nevertheless, the agencies are experimenting with virtual reality technology and should continue to search for practical, cost-effective ways to incorporate that technology into fire training simulations and simulators.

Implementation Strategy 4 – Develop a family of simulations.

To better compensate for lack of experience through training, all tactical and strategy training, including S-131, S-200, S-330, and S-336 should be given high priority for increased realism through use of scenarios and simulation, as technologies (and budgets) permit. The agencies should develop a family of "hot seat"-style fire simulations. The agencies would use the simulations to develop people's Recognition Primed Decision-making (RPD) skills, apply other instructional objectives in "high tempo" environments and evaluate performance.[24] Simulation exercises should incorporate computer modeling of fire behavior where appropriate.

The agencies should design simulated exercises to convey the critical necessity for clear thinking and decision making in time sensitive situations, and condition participants to react to situations reflexively and with consistent approaches. In these simulations, instructors would scrutinize participant actions and decisions and actively coach, correct and evaluate trainees against established performance standards. Simulation exercises can be cost-effective and would benefit the agencies through low risk exposure. This strategy should be implemented in concert with other goals related to decision-making training discussed later in this report.

Implementation Strategy 5 – Use more visual, interactive multimedia training.

A strong suggestion from many firefighters in Phase I was to make training more visual, to get across a better sense of different situations, and to make training more interesting.

"Multimedia" technology is the carefully orchestrated interaction of video, audio, text, graphics, slides, and animation. "Interactive Computer-based Training" enables users

[24] Recognition-Primed Decision-making is discussed in the Phase I and II reports, and later in this report. Basically, it is sizing up a situation and determining if it is "typical," in which case the typical reaction to the situation is used as the starting point for deliberation on what to do. If the "typical" reaction appears likely to be adequate, no other options need be considered. If the typical is not adequate, you move to others in your experience. If none of those fit, you move into "problem solving" to find a reaction that will work.

to control the pace and direction of information using a computer. Combining these concepts produces "interactive multimedia training."[25]

Evaluation of multi-media training has shown that it is effective and produces results such as a 25 percent gain in retention over single medium training, a 50 percent reduction in training time, and a 40 percent increase in interest and motivation.[26]

In addition, computer-based training offers the following advantages:

- Students can work alone with the computer in privacy.
- The student can shut down the system, and later to resume where they left off at any time.
- Computer equipment can be mobilized to almost any office site.

The training coordinator can review and track the student's inputs, selections, and performance for certification purposes.

The agencies, through the BIFC Division of Training and the NWCG Training Working Team, should consider a joint venture with the Alberta Environmental Training Center (as was done with the S-290 CD-ROM package) to develop CD-ROM based firefighter safety training materials, and other interactive multimedia training that is more visual than text.

Implementation Strategy 6 – Prepare for Out-of-Region Experience.

A strength of the current wildland fire management system is the ability to quickly mobilize and transport crews across the nation. However, firefighters and fire managers interviewed in Phase I raised concerns about inexperienced crews transported from their home area to another geographic area where they were not familiar with hazards posed by local fuels, terrain, or weather. One cannot realistically require crews to

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[25] Recent examples of a more visual, scenario-based approach is the new LCES training package being developed by Paul Chamberlain , at Missoula, the new Fire Fatality Case Studies course developed by Jim Cook at Boise, and a joint FS/NPS project to develop video modules for the NWCG "Tactics Guide" (to be used in all appropriate courses). These are all in the right direction, being developed by Clark Noble, at Boise.

[26] Presentation made by Rob Thorburn (Alberta Environmental Training Center, Alberta Environmental Protection) at the "Canada/U.S. Wildland Fire Safety Summit," Rossland, B.C., September 30, 1997.

have experience with all types of fuels and terrain they may encounter on an out-of-region assignment. Fortunately, there are at least three ways to reduce this problem:

- As part of initial training, give all crews an idea of the wide variation in fuels, types of terrain and climate they may encounter, stressing the potentially most dangerous situations (this would be just a brief introduction to the subject, to sensitize them to the issue).
- Brief crews en route to a fire or at the fire on local conditions of importance to their safety (e.g., the rate of spread in the local fuel and fire behavior in local terrain).
- Provide crews with supervisors experienced in local conditions.

Training for Other Regions – All NWCG fire behavior training courses already employ "the fire environment concept," and discuss the conditions, influences, and modifying forces that control fire behavior. As Countryman stated, "Fire must obey physical laws. We consider certain types of fire behavior unusual or unexpected only because we have failed to evaluate properly the conditions, influences, and forces that are in control."[27] This concept remains sound.[28]

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[27] Countryman, Clive M., *The Fire Environment Concept,* Berkeley, Pacific Southwest Forest and Range Experiment Station – Forest Service, 1972. (Revised for inclusion in Intermediate Fire Behavior, S-290, 1992.)

[28] The fire environment concept is well represented in three courses that are mandatory training in the critical positions of Firefighter, Single Resource Boss (Crew Supervisor, Engine Boss, Dozer Boss, Tractor/Plow Boss), and Strike Team/Task Force Leader. The concept is first introduced in the foundation course S-190 (Introduction to Wildland Fire Behavior) and is expanded comprehensively through S-290 (Intermediate Wildland Fire Behavior) and S-390 (Introduction to Wildland Fire Behavior Calculations). All three courses were revised in 1994, and an interactive CD-ROM version of S-290 is awaiting approval. S-190 is required training for firefighter qualification and is designed to train firefighters in the basic fire behavior factors that will aid them in the safe and effective control of wildland fires. S-290 is mandatory for qualification at the Single Resource Boss level and is a "skill course" designed to instruct prospective fireline supervisors in wildland fire behavior to produce effective and safe operations.

S-390 is mandatory training for qualification as a Strike Team/Task Force Leader and is also a skill course for that level of prospective supervisors. It is designed for use throughout the United States, and is (or at least used to be) the first place in the curriculum where specific fuel models used to estimate fire behavior across the country are introduced. The curriculum is continually being revised in a very positive way.

The newly revised S-330 (Strike Team/Task Force Leader) puts additional emphasis on fire behavior and its impacts on tactics in safety. This development is a positive and welcome addition to the fire training curriculum.

Federal agencies in the United States are recognized as world leaders in theoretical and applied research into wildland fire behavior, prediction of wildland fire behavior, and fire behavior training. The current fire behavior training system could and should adequately prepare firefighters for fire assignments in a variety of conditions found throughout the country. However, the curriculum and its delivery contain small, but important flaws that can be fixed (and should be).

Under the national mobilization concept, crews, individual resources, and fireline Incident Management Teams are moved to areas of critical need. Individual firefighters, squad leaders, and, most importantly, crew and other single resource bosses must be prepared to fight fire outside their local area or region safely. However, the fire behavior curriculum first introduces specific fuel models and a national perspective on fire environment differences in S-390, a course designed to prepare Strike Team/Task Force Leaders.

Ironically, the S-390 course description and instructor guide say that "Fire environment differences are discussed when important." They direct instructors to "stress local and regional conditions." Many observers know that course coordinators and instructors "localize and regionalize" this training liberally, at the expense of preparing trainees for conditions found outside their local area or region.

Though the NWCG briefly experimented with laser disc technology for visual support of the S-390 course, the fire behavior curriculum makes little use of multimedia technology. As stated earlier, simulations and simulators can replace some experience, and can facilitate hands-on exercises that recreate real situations in various geographic areas.

We recommend that at least some attention be given throughout the curriculum to potentially dangerous conditions that could be encountered in other areas, and not wait until S-390. The agencies (through the NWCG) should make the following revisions to the fire behavior curriculum:

1. Develop a module, supported by video examples, for S-190 to introduce fire behavior in the 13 fuel models used to estimate fire behavior. The intent is not to acquaint trainees with mathematical fire behavior prediction, but rather to familiarize them with the range of conditions found throughout the United

States and potential fire behavior under those conditions. The theme should be picked up and expanded in a module for S-290, again not for the purposes of making fire behavior calculations, but for displaying fire behavior in a variety of fuel models under varying atmospheric and topographic conditions.

2. Existing slide sets and video tapes, available through the National Fire Equipment System (NFES) publications catalog, should be used as multimedia support of the new S-190 and 290 modules. However, the emphasis should be on highly realistic exposure to fire behavior conditions. Video disc and computer simulations of fireground conditions should be developed to support training scenarios. This approach is consistent with goals and strategies related to highly realistic training, substituting experience with training and Recognition-Primed Decision-making (RPD) found elsewhere in this report.

3. The agencies should use the Interactive CD-ROM version of S-290 when it is available, and pursue development of a similar S-190 package.

4. The S-390 course description and Instructor's Guide should be revised to reflect the need to train people to respond to fires outside their region, and to address firefighter safety issues in support of the national mobilization concept. S-390 should employ extensive videodisk and computer modeling applications to allow students to visualize realistic examples of fire conditions under varying atmospheric and terrain conditions in many fuel models.

5. The newly revised S-330 course and S-339 (Division/Group Supervisor) course currently under development should be supported by simulator technology or other realistic scenarios as soon as possible. At this level of training, trainees should be exercising decision-making skills in high-tempo training environments.

Briefings for Out-of-Region Resources – The agencies should develop a joint protocol for briefing out-of-region resources before assignment, not unlike approaches used in California's South Zone and Alaska in the past. The joint protocol would be carried out through the auspices of the NWCG, and should include guidelines for conducting separate initial briefings for resources arriving from outside their local region. Applying these guidelines, an Incident Management Team might assemble groups of out-

of-region resources as they checked in to provide a short, but intensive briefing on local conditions, fire behavior, and other expectations. Briefing guidelines currently exist and are used by Incident Management Teams, fireline Incident Management Team and Agency Administrators and their staffs. Full implementation of this strategy will require that the agencies incorporate the new guidelines into all appropriate training materials and the Fireline Handbook when they are completed.

It also may be useful to formalize sharing fine danger/fire behavior information about an area via e-mail or other means when mobilizations to the area appear likely.

Provide Local Oversight – Similarly, the agencies should develop a joint protocol for assuring adequate supervision and safety oversight for out-of-region resources before they enter assigned status. This joint protocol should include guidelines for assigning out-of-region resources and their associated Incident Management Team. The intent is to prevent situations where an out-of-region resources without experience in the local fuel type, terrain or conditions are supervised by an out-of-region Incident Management Team with the same limitations. When completed, the agencies must incorporate these guidelines into appropriate Planning Section training and references and the Fireline Handbook.

Goal 15. Ensure that individuals and crews in low fire incidence areas have the opportunities for experience in other areas, and/or have adequate oversight when sent to different or complex situations.

Goal 15 addresses lack of experience from working in a low fire incidence area versus Goal 14, which addressed lack of familiarity with other areas in general.

Implementation Strategy 1 – Provide opportunities to work in high incidence areas.

When possible, it would be desirable to provide individuals and crews with opportunities for experience in higher fire incidence units out of their immediate area. That gives them the exposure to other fire environments and also increases the number of fires they attend.

The agencies should consider FMOs as well as crews and Crew Supervisors for detail assignments to high fire incidence areas, backfilling their home agency positions as necessary. This policy would increase experience levels of those with the lowest

experience, and also be fair in balancing risk and workload among individuals. It will, however, cost more in transportation. The FMOs would get to see more complex fire programs, and different or more complex incidents. In some cases this strategy might increase the number of times when people will fight fires in unfamiliar terrain (by sending fire managers to another area to which they might not otherwise ever get to). Note that FMOs (and others) may be detailed to firefighting assignments or roles other than their own as an alternative to a detail in their own job, and get much (perhaps even more) out of the experience.

Integrity of Certification and Qualification System

Achieving a culture of firefighting excellence and safety will require getting renewed respect for the performance-based training and qualifications system. The agencies use this system to qualify and certify fire suppression personnel. "Red Cards," the certification instrument, should be a strong and positive symbol that inspires confidence in its veracity and validity. The performance-based system's credibility is directly linked to people's perceptions about its impact on the performance of fireline Incident Management Team and the Red Card's effectiveness as a measure of experience.

Results from the system's first few years have been mixed. People have expressed three principal concerns – that some certification requirements were too easy; that some certifications were made without the requirements being met; and that qualifications were not consistently checked in the field. This is more a poor application of the performance-based qualification system than a problem with the system itself. In addition, field level units have had difficulty in carrying out the performance-based system, which has harmed the system's credibility and the workforce's trust of the system and its commitment to it.

Furthermore, the performance-based training system's "suggested" training term has not produced the result originally intended by the NWCG. The developers of the performance-based system envisioned that the use of the term "suggested training" would eliminate duplication and cut costs by allowing people to achieve equivalency through experience, other training or on-the-job training. However, the term "suggested training" has confused people and connoted "nice to have, but unnecessary" to many. Concerns in the Phase I survey about the quality and performance of "the Incident Management Team" derive, in part, from this trend. People expressed the most concern about the preparation and certification of Crew Supervisors, Division Supervisors, and the criteria

used to prepare and select Agency Administrators. In some cases, factors other than competency alone must be considered in making job offers and promoting the Native American preference law, for example, which significantly affects firefighter hiring in BIA.

Goal 16. Certifications (e.g., Red Cards) should be meaningful indications that a person is ready to take on the requirements of the job they are certified for.

The agencies should continue firm support of the current performance-based system, since it is a better way of obtaining and measuring performance. However, the following changes should be made.

Implementation Strategy 1 – Better explain the intent of the system and its requirements.

The NIIMS Wildland Fire Qualifications Subsystem Guide (310-1) is being revised in 1997/98. As part of that revision, the agencies (working through NWCG) should emphasize that the purpose of the 310-1 is to provide minimum qualification requirements that can be augmented by individual agencies if they so choose.

We also recommend dropping the term "suggested training." Instead, first describe the "Required" or "Mandatory" training for each position in the system, and describe the other training or its equivalent that are needed. Make clear that people can be exempted from non-mandatory training if they have attained equivalency through experience, other training, or OJT. This revision will retain the benefits intended (reduced duplication and cost), but better describe the intent of this feature of the performance-based system.

Implementation Strategy 2 – Train managers better on implementing performance-based certification.

The agencies should provide more effective implementation training on the performance-based training system. The training should enable people to manage its features and requirements effectively. The NWCG-Training Working Team is currently tasked to develop and implement this training, and has placed a high priority on the project.

Implementation Strategy 3 – Revise Position Task Books if necessary.

The agencies should continue using Position Task Books (PTB) as indicators of experience for initial qualification, but need to modify the requirements and clarify the wording as deemed necessary by the NWCG Incident Operations Standards Working Team.[29]

At least some fire managers feel that the number and quality of assignments required before being eligible to start the process for the next higher level is way too low, especially for division supervisors – that may be the underlying cause of the quote in the Executive Summary that "one in five division supervisors were really scary."

Implementation Strategy 4 – Use key tasks from the Position Task Books in performance evaluations.

To further strengthen the importance of the Task Books, and to improve performance evaluation and accountability, use key tasks from them to develop performance evaluation criteria for evaluating on-incident performance. After-action performance evaluations should be mandatory, and should determine whether individual certification may continue without any remediation. (See Goals 2 and 6 for additional comments regarding performance evaluation and accountability.)

Implementation Strategy 5 – Toughen currency requirements.

See Goal 11, Implementation Strategy 4, regarding requirements for currency of certification.

Implementation Strategy 6 – Make training "required" (versus "suggested") to achieve qualifications.

Many Operations and Command courses, including training required for subordinate positions, should be mandatory for people intending to obtain qualifications in Operations or Command roles, especially those with direct impact on tactics and safety. At present, some of the needed training is "suggested" rather than mandatory.

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[29] Position Task Book revisions are in progress.

We suggest that the following courses be required for the positions indicated. This list is not all-inclusive, but provides some important examples.

Fire behavior training should be mandatory for qualification for all Operations functions, for Incident Commanders Type 3 and 4, and for many Planning functions. It is already a requirement for some of these positions; the status quo should be maintained for them.

Functional Command and General Staff training including I-400 (Incident Commander), I-404 (Safety Officer), I-430 (Operations Section Chief), and I-440 (Planning Section Chief) should be mandatory for qualification in those positions. The system should also require I-420 (Command and General Staff) for qualification in these positions.

The new Unit Leader course (S-320) should be required for employees intending to perform at the Unit Leader level in any ICS function.

The Division/Group Supervisor (DIVS) requirement should be retained for Air Tactical Group Supervisor (ATGS), but in addition, ATGS training (S-378) should be a requirement for qualification as Air Operations Branch Director.

Goal 17. Signing off on Red Card credentials without reasonable evidence that the person has met all of the requirements should be a punishable offense.

Some people have reported that certifications have been made without the requirements being met, to help friends, or because of a lack of respect or understanding for the certification requirements. The system employs a three pronged approach, and the standards for all three elements (training, experience, and performance competency) must be vigorously and honestly applied.

Implementation Strategy 1 – Educate and build confidence about the system.

By carrying out the strategies listed above under Goal 16, there should be increased respect for the performance-based training system and the Red Card's role as an indicator of training and experience. In the course of training people to implement the performance-based system successfully, the agencies will increase the understanding of

that system. Improved understanding will inspire confidence and heighten people's trust of the performance-based training scheme and their commitment to it.

Implementation Strategy 2 – Utilize disciplinary actions when appropriate.

The agencies must prepare to handle both unintentional misapplications and deliberate abuses of the system. To protect the integrity of the Red Card system, no abuses to the certification process can be tolerated. Swift and severe disciplinary action, consistent with the disciplinary procedures of the agencies, should be taken against anyone found to have knowingly misused the qualification and certification system to benefit themselves or another party.

Goal 18. Credentials should be reviewed for all resources before the resources are utilized.

As intended, Incident Management Teams and Incident Commanders use the Red Card to facilitate the verification of fireline qualifications. This usually is done when resources "check-in," or report for assignment on a fire or other incident. The check-in process is a "common responsibility" of the Incident Command System (ICS). It is well documented, and is presented in many training courses throughout the "I" and "S" curricula.[30] On larger or complex incidents controlled by Incident Management Teams, the check-in process is usually well-defined and takes place at the Incident Command Post, Base Camp, Staging Area or other point of contact. Nevertheless, there have been many incidents where crews or individuals without adequate credentials slip by the system.

As a "common responsibility," the check-in process is supposed to occur on every incident, regardless of size or management. For the initial or extended attack on wildland fires, resources typically respond directly to the fire and/or tactical assignments. Sometimes people are instructed to report directly to a tactical assignment on larger fires as well. In these circumstances the Incident Commander or a member of the fireline Incident Management Team assumes responsibility for knowing people's qualifications and deploying resources appropriately.

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[30] See Common Responsibilities (Module 6 in the I-200 course) from the Incident Command System National Training Curriculum for example.

Three flaws exist in the system as it stands today; none of them should be difficult to repair. First, reports from the field show that the diligence with which check-ins are conducted is inconsistent and varies across the spectrum of Incident Management Teams. A flaw in the ICS and associated training materials is likely contributing to this irregularity.

Second, the check-in approach for resources reporting directly to the fireline and/or tactical assignments is flawed. If the check-in process is to support the improvement of safety, adequate vetting of credentials must occur regardless of reporting location.

The check-in approach outlined in the ICS training materials could be viewed as contradicting an essential ICS principle – under the ICS, the Incident Commander (IC) performs all functions unless other organizational elements have been activated and the IC has delegated the authority to perform certain functions to them. If no Planning Section or Check-in Recorder has been established, or the resources have bypassed the Incident Command Post, the check-in function still should be performed. However, under the current training direction it can be construed that you can check in after returning from the fireline.

Finally, we interviewed people familiar with the internal functioning of Incident Management Teams. Some of them revealed shortcomings in the collection and application of the information received through the check-in process. For example, often a few overworked check-in recorders must process hundreds, and sometimes thousands, of firefighters using a paper-based check-in process. They necessarily limit the information they collect to only what is needed to administer basic planning functions and aid demobilization. In addition, the check-in information collected is often put to only minimal use. This is true, in part, because the information is recorded on paper forms that can be accessed by one person at a time and only in the Planning Section workspace. Others have said that information is not well shared between the Planning and Operations Sections, resulting in uninformed decisions by both.

The above problems led to the following recommendations:

Implementation Strategy 1 – Revise ICS training materials regarding check-in.

ICS training materials advise that "Agencies will often have different procedures associated with incident responsibilities. The checklists provided in this module will cover most of the major requirements. However, some agencies may need to augment the checklists." This approach leaves too much open to interpretation for the check-in process to influence decision-making, resource deployment and firefighter safety. The agencies (through appropriate NWCG working teams) should evaluate the information contained in the check-in checklists and revise them as necessary to meet the aims of this goal. ICS and planning function training should be amended to reflect their revisions and strengthen the approach. Training should emphasize that certain check-in information represents *minimum standards*, but that *these minimum standards may be augmented.*

Secondly, ICS training teaches firefighters that "If instructed to report directly to a tactical assignment, you should report to the designated Division or Group Supervisor or to the Operations Section Chief or Incident Commander depending on the level of ICS activation. After release from tactical assignment you will formally check-in at one of the above locations" (incident command post, base or camp, staging area, helibase). Though implied, it is not explicit that the fireline Incident Management Team should still verify credentials in these situations. The Division Supervisor, Group Supervisor, Operations Section Chief, or IC should review credentials before assigning resources or making deployment decisions. The Crew Supervisors or other resources checking in should be expected to have integrity, and to point out the lack of appropriate credentials for any members.

Many people believe that initial attack, extended attack, and fires in transition represent the very most dangerous firefighting environments. Ironically, these are the fires where resources are most likely to report directly to tactical assignments, without verification of credentials. They also are the fires where the situation's complexity exceeds the capability of the initial forces on-site.

We do not mean for this implementation strategy to be blindly bureaucratic. In any field situation, you expect the IC to make the ultimate decision about staffing and an individual's capabilities in filling critical positions. Some flexibility is needed.

Implementation Strategy 2 – Motivate the check-in recorders concerning the importance of their role.

Many times, any available "warm bodies" are assigned to be check-in recorders. The function is often perceived as a bureaucratic requirement. Untrained personnel are frequently assigned to it and given only a cursory introduction on to how to fill out the forms. In the future, the agencies should place more importance on the check-in function and the ICS and suppression training that prepares people for it. An improved focus on the check-in function will provide accurate information for strategic and tactical decisions, and therefore improve overall performance and firefighter safety.

Implementation Strategy 3 – Develop "smart" Red Cards that allow quicker, more accurate check-in of individuals.

In the slightly longer term, the agencies should enhance the current check-in system by developing "smart" Red Cards that can be used in a computer-based resource tracking system. Smart Red Cards may be bar-coded, or may use embedded chips that contain electronically-encrypted information. Smart cards would enable check-in recorders to retrieve electronically more information with greater accuracy in less time than at present. The information could be immediately downloaded to a computer database and shared by all management team functions, particularly Planning, Operations, and Finance.

Red Cards will still need to include visible information; the resource tracking function must include a manual fallback option, that enables ICs and Incident Management Teams to review credentials and track resources at remote fires without computers or electric power, on the fireline, during equipment failures, etc.

It is, perhaps, paradoxical to suggest that automating incident information management has a direct bearing on firefighter safety. Several safety goals discussed in this study, however, require quick, accurate access to information about firefighters: qualifications for assignment, other qualifications for possible reassignment, and assignment duration as it relates to fatigue and fitness levels. Managing an incident is as much about having accurate, accessible information about resources as it is knowing the productive capabilities of resources.

It is imperative, then, that the fire bureaus initiate development of a single, integrated system to manage incident information, with dependable electronic communication to the jurisdiction unit or coordination center. "Smart" Red Cards are a necessary component of that system.

Implementation Strategy 4 – Ensure that IMT training stresses the need to consider and share information on status and certifications of crews at check-in.

All members of an Incident Management Team's Command and General Staff, including the Planning Section Chief and Operations Section Chief attend S-420 (Command and General Staff) as part of their required training. S-420 is a simulation exercise which takes complete Type II Incident Management Teams through common and specific responsibilities of the team's members, stressing their collaborative efforts and interaction.

Among the evolutions involved in this simulation exercise, participants must provide for the safety and welfare of assigned personnel and establish and maintain positive interpersonal working relationships; assess the fire situation and determine resource needs; staff and adjust the organization as necessary; brief and debrief staff members; assign work and coordinate staff activities, manage planning meetings; approve incident action plans; and plan, approve, and initiate demobilization functions. Aspiring Type I (National) team members must also attend S-520 (Advanced Incident Management), an advanced team exercise. S-520 trains a fully functional IMT to understand team dynamics and how to operate under extreme stress.

The agencies (through the NWCG Training and Incident Operations Standards Working Teams) should ensure that these courses reflect the need for the Planning Section of both Type I and Type II Incident Management Teams to collect and manage fireline qualification information if they are going to provide for the safety of assigned personnel throughout the duration of the incident, and make informed resource deployment decisions. It is particularly important that the Planning and Operations Sections are encouraged by their training to share information and collaborate on informed decisions as they determine resource needs, staff and adjust their organization and deploy resources.

The agencies also can implement this strategy by encouraging the inclusion of Operations Section personnel in Planning Section training courses and vice versa. We

have seen effective examples of courses where an Operations Section Chief was invited to instruct Situation and Resource Leaders, and where Situation and Resource Unit Leaders were brought in to teach Operations Section Chiefs.

Implementation Strategy 5 – Ensure equality of review across positions.

The check-in process and the review of qualifications or credentials should apply to all types and levels of fire management resources. The agencies should apply the same vigor in reviewing the credentials of agency regulars, interagency cooperators, temporary hires, contractors, and local government forces. The agencies will continue to operate under the principles of the National Interagency Incident Management System (which includes the Incident Command System approach) and under existing interagency agreements. However, the agencies should ensure that all fireline resources meet the standards that apply to them before these resources are assigned to tactical duty.

Symbols and Insignia – Another way to display credentials is through the insignia on uniforms that indicate qualification level and special skills. The use of insignia drew enthusiastic support or fierce disapproval among those interviewed. The use of insignia would represent a profound cultural change in many quarters of the wildland fire community.

Some argue that insignia help identify leaders and would aid in fireline task delegation. Others argue that insignia emphasize distinctions and promote elitism in the firefighters' largely democratic workplace. Dr. Patrick Withen, a sociologist with over 20 years of wildland fire experience, found in his research that wildland firefighters' work relationships are quite democratic in nature, as is their decision-making approach.[31] The use of insignia might change this culture in an undesired and unintended way.

Structural fire departments use insignia to show rank or position (Chief, Battalion Chief, Captain, etc.) and/or level of qualification (Firefighter I, Firefighter II, etc.). However, we have seen no persuasive case made for use of insignia for wildland

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[31] Patrick Within, Lower Level Employees' Participation in Organization-wide Issues – Wildland Firefighters' Participation in National Fire Policy Formulation, Ph.D. Dissertation, Boston College Department of Sociology, 1994.

firefighters. It is true that quickly identifying a person's level of qualification on the fireline would be valuable to help find someone of appropriate level to do a task or take command in a hurry. However, there is a danger that insignia in the ICS-based wildland fire organization could cause confusion. For example, a person wearing an "OSC2" (Operations Section Chief Type II) sticker to denote his or her training level may be serving in the capacity of Crew Supervisor on the fire. Training level and current assignment differ quite often. On the other hand, having the insignia provides more information than not having insignia. Although we cannot recommend the use of insignia, to be open-minded, we suggest the following:

Implementation Strategy 6 – Evaluate the acceptance level for insignia.

The agencies should conduct focus groups using members of the workforce, and evaluate the pros and cons and acceptance level for using insignia that would show each person's highest operations training level. The agencies should pursue a universal approach toward insignia through the NWCG if there is support for it.

Hardhat stickers represent the most realistic option for displaying insignia. They are inexpensive and changeable. Sewn patches would prove impractical, because many articles of fire clothing are exchanged at incident bases, or are laundered and returned to regional fire caches. "Collar brass" and other forms of removable insignia would likely prove cost prohibitive and are viewed as more elitist.

Interpersonal Communications

Interpersonal communication is an area in great need of change in the firefighting culture. Clear, understandable communications is one of the pillars of safety. The current methods of communication that are common in the wildland fire community tend to be "one-way." Information is sent up or down the line, without adequate checks to see that it got through and that it was understood. The agencies need to change the ways in which fire people communicate, requiring both attitudinal and behavioral change and a fundamental change in existing culture.

Traditionally, a great deal of fireline communication involves "sending messages," "giving directions," "briefing people," and "giving orders," all authoritarian, one-way styles of communication. Correspondingly, firefighters expect "to be told" and often

passively await instructions, often failing to ask when information is not provided. These communication styles reduce assurance that messages get through and are understood, which can greatly affect safety.

Many firefighters are hesitant to ask for information they have not received. Firefighters also often hesitate to ask for clarification of garbled radio transmissions to avoid embarrassment. Some firefighters consider it "bad form," not macho, or uncool to request a repeat of a message garbled by poor radio transmission or indistinct speaking, or containing unclear instructions.

There is a need to improve both the physical quality (transmission clarity) and the comprehension (understandability) of communications on the fireline. The agencies will greatly improve their safety and effectiveness by promoting a culture that uses dialogue, not one-way communications, and that expects both the sender and the receiver to take responsibility for clear communications. This operating climate should include desirable communication norms (informal and unstated rules) and formally sanctioned communication processes, and protocols.

A productive and successful model of communications is one that views the communication process as an interactive exchange. An interactive approach recognizes and minimizes the barriers to effective communication that cause misunderstanding. It puts responsibility not only on communication gatekeepers to foster understanding, but on everyone – senders and receivers alike. These characteristics, coupled with the concept of "respectful interaction" (politely but assertively raising safety concerns), should form the desirable norms of communication within the wildland fire community.

Crew Resource Management – A variation on the dialog concept is the use of a set of interactive communication and assertiveness skills and processes that have been associated with the "crew resource management (CRM) concept,"[32] which is discussed

[32] Though associated with CRM, the communication protocols used in the aviation industry were developed outside of the CRM approach to address specific operational issues within the aviation environment. The wildland fire community is struggling with many similar operational communications issues.

more fully in Chapter 6. CRM training includes communication and assertiveness skills that relate to wildland firefighting:[33]

Communication Skills

- Use standard terminology
- Provide information as required
- Provide information when asked
- Ask for clarification
- Assume a response is negative if no reply (i.e., if you ask a person if they are okay and there is no response, you need to see if they are in trouble)
- Acknowledge communication
- Repeat information
- Reply with a question or comment
- Use nonverbal communication appropriately

Assertiveness Skills

- Advocate a specific course of action
- State opinions on decisions and procedures, even to the higher ranking
- Ask questions when uncertain
- Make suggestions
- Raise questions about procedures

Training in these skills would assist firefighters to understand modes of communication in hierarchical, command and control environments, and help them focus on communication methods that avoid or mitigate communication errors. This training will assist in reinforcing formally sanctioned communication processes and protocols.

Information Flow – Besides improving attitudes and behavior regarding interpersonal communication, the agencies must address problems with: a) the application of their communication technology, b) the quality of briefings, and c) the quality of dispatching. There is a need to improve both the quality and quantity of communications

[33] USDA Forest Service Fire and Aviation, Findings of the Human Factors Workshop, Missoula, Montana, 1995.

channels used on the fireline. Communications hardware concerns will be addressed later in Goals 23 and 24. Here we address the human side of communications.

A National Park Service (NPS) work group analyzed a series of fire entrapments involving more than 300 firefighters that occurred between 1985 and 1989.[34] They found that on seven of the 12 incidents reviewed, firefighters observed a breakdown in communications. In very few instances did the communication failure involve equipment failure. Fifty percent of the incident reports noted disruption in the flow of vital information between the incident management and the line personnel. In several instances, Crew Supervisors did not adequately communicate escape routes to their crews.[35]

Radio Discipline –While increased communication and information flow is desirable and necessary, we must also recognize that increased information flow requires disciplined radio communication and increased radio system capacity. The intended result is to increase the flow of important information through interaction, without the unintended result of flooding the available radio communication frequencies and interfering with critical messages. This is simultaneously an issue of training, discipline, infrastructure and technology.

Standard Terminology and Protocols – When the agencies transitioned to the Incident Command System (ICS) in the 1980s, they adopted the concept of "clear text" communications in place of complicated radio codes. The ICS considers communication clear text (the absence of radio codes) to represent an essential part of an effective multi-agency incident management system, and we agree. However, for many, the shift to clear text meant "just use common sense" without standard phrases or protocols. The Incident Command System's designers did not envision clear text this way. Sometimes the consequences include undisciplined, inefficient demands on a limited resource and jammed frequencies that block the transfer of critical information; this has enormous fire safety implications. Some field units diligently teach radio use while others expect users to pick it up on their own.

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[34] USDI National Park Service, Fire Entrapments and Shelter Deployments, Internal memorandum from Jack Morehead - Associate Director, Operations, 1990.

[35] An effort should be made to identify any other studies such as this, and review them for lessons learned, to be used in training and as inputs to refining reporting systems.

Incident Base Briefings – People whom we interviewed or surveyed frequently mentioned incident base briefings as examples of poor communication and information flow. Too often large groups jam into inadequate spaces for a briefing with, at best, a poor sound system, and try to listen over the noise of generators and other distractions. Frequently, only the participants nearest the front can see or hear the person presenting information. The limited time rarely permits an opportunity for questions or interaction (briefings are held just prior to resources reporting to their transportation or tactical operational period) and most information is "delivered" without clarification or opportunities to confirm understanding. The NPS entrapment analysis found that Incident Action Plans (IAP) were often outdated by the time they reached the line and sometimes contained incorrect information. Briefings are intended as the vehicle for transferring critically important strategic, tactical, safety, and other operational information to people who will be on the fireline and in harm's way for the next 12 hours. Of course situations may change after a briefing and situational awareness needs to be maintained throughout an operational period. But still, the briefings, appear to be woefully inadequate to achieve their goal in too many cases.

Comprehensive Communication Strategy – Resolving the agencies' communication issues will require a comprehensive approach that includes improvements in communication "soft skills"; establishment of sanctioned communication processes, procedures, and protocols; radio system capacity improvements; adequate distribution of radios; and diligent accountability for change. Evidence shows that organizations employing skills and protocols such as those outlined below achieve "organizational resiliency" in emergencies through clear and fail-safe communication.

Goal 19. One-way communication should be replaced by two-way dialog. People at each level of the fire hierarchy should be comfortable with requesting clarification of information, or requesting additional information. There should be no stigma attached to requesting clarification; it should be considered professional to do so.

Implementation Strategy 1 – Start training in interpersonal communications with the very first firefighting training, and expand the training to include the new concepts presented here.

Place communications training early in the fire training curricula and make it requisite (mandatory) for qualification in all five ICS functions (Command, Operations, Planning, Logistics, and Finance.) The newly released S-201 (Supervisory Concepts and

Techniques) and S-301 (Leadership and Organizational Development) courses include well-developed communications units that provide excellent foundations.

However, communications training should first be established at the firefighter or advanced firefighter level, and then comprehensively and consistently developed throughout the curricula. The two-pronged change to introductory training is 1) showing that, bottom-line, everyone is responsible for his or her own safety, and 2) that a few communications elements are essential to achieving that goal. Communications training modules (including S-201 and S-301) should achieve the following objectives through instruction reinforced by application exercises:

- Foster a climate of interaction and interdependence (teamwork approach) among all people interacting in fire operations
- Teach people to communicate interactively and respectfully (two-way communications and respectful interaction)
- Legitimize and encourage querying
- Teach people to communicate assertively (versus the extremes of passivity and aggressiveness).
- Teach people the skills of querying, formally acknowledging, and providing feedback.

Interpersonal communications training modules preferably should be conducted by professionals in the fields of organizational behavior, communications, or human relations, or by fire professionals with extensive background and preparation in these areas. (Most fire professionals are trained in command and control communications techniques, but may not be the best ones to select as change agents in communications.) This implementation strategy should be carried out in concert with the CRM strategies discussed in Chapter 6 of this report and the following strategies below.

Communications skills, developed early in the curriculum, should be consistently reinforced and applied in operational contexts throughout the curricula. Tactical and functional training should exercise the communications objectives listed above and achieve the following objectives through instruction and by application exercises:

- What the operational roles and responsibilities are regarding communication

- What techniques work well to keep communication flowing in that environment and for that operation
- What common problems or communication barriers can be expected
- What devices and techniques can effectively mitigate these problems or barriers

Implementation Strategy 2 – Require formal acknowledgments, especially in radio communication.

At present, much communication is one-way (sender to receiver) with little or no indication whether the communication was received or how it was understood. Formal acknowledgment is not common in everyday communication, and people expect ambiguity to resolve itself. The agencies must require acknowledgment of all radio and many verbal communications. One of three levels of acknowledgment should be required for every message:

Level 1 - Simple acknowledgment when receiving routine information. For example:

Sender: "Meals are being dropped off at Drop Point 2.
Receiver: "Copy" (or "Copy, Drop Point 2.")
In person, one simply observes whether the person "got it."

Level 2: Acknowledgment and feedback of a kernel of key information. For example:

Sender: "Take your crew to the helispot."
Receiver: "Copy, crew to helispot."
Or
Sender: "Construct line on the east flank from the creek to the division break."
Receiver: "Copy, dig from creek to the division break."
Or
Sender: "Relief crew coming at 0500."
Receiver: "Copy, relief at 0500."

Level 3: Acknowledgment of more complex instruction. This also provides a vehicle for a possible dialogue on its interpretation, or an opportunity to ask for clarification. Here, the receiver may repeat the

direction on where to go and what to do, and discuss what is expected if that is not clear. For example:

Sender: "Dry cold front passing through the fire area in about two hours. Be prepared to pull out in one hour."

Receiver: "Front in two hours. Possible pullout in one hour. Is road 4355 still our escape route?"

Or

Sender: "Extra three crews you requested not available today."

Receiver: "Extra crews unavailable. Probably can't hold additional line. Any change in plans, or do we keep digging?"

The sender (including dispatchers and Incident Management Team members) must have the obligation not to sign-off until acknowledgment is received, and the sender believes the receiver is "getting it." This may require probing: "Did you copy?" or "Please acknowledge." If the sender thinks the receiver is unclear about what the sender considers a vital piece of information, for example a critical time or piece of weather information, the sender must continue the initiative until satisfied that the receiver understood the message and its possible implication. The agencies will need to train and encourage dispatchers and others to sense a lack of understanding or a balkiness to comply with an instruction. All personnel, including dispatchers, Incident Management Teams, and other supervisors must acknowledge messages as part of a communications standard operating procedure (SOP).

The receivers must be taught that they have responsibility to acknowledge messages, and to query if they did not understand what was sent. Failure to acknowledge should be considered not getting through, especially for critical pieces of information relevant to safety. No response would be taken to mean a negative reply (failure to receive or understand the message).

When non-routine messages are broadcast to more than one receiver, acknowledgments should be made by the units either in some prescribed order, or polled by the sender ("Crew A"–"Understand"; "Crew B" – "Copied," Crew C, etc.) This should also be part of communications SOP.

Implementation Strategy 3 – Legitimize and encourage the asking of questions.

Many firefighters are reluctant to ask their supervisor about the wisdom of a course of action or an unnoticed danger. People fear that the boss might think a question is challenging their authority. The culture must change to establish the legitimacy of asking questions about safety. The agencies can increase comfort with this concept in several ways:

- Publish examples of queries that led to a positive change in action (for example, a crew member pointed out a hazard, the need for a second escape route, a better safety zone, or suggested posting a lookout).
- Get the new supervisor of an existing unit (crew or team), or the supervisor of a newly formed unit to say something like the following at their first meeting: "You don't know me and may be concerned about speaking up if you see a problem, but don't hesitate to do so. When you get to know me better you'll see I appreciate it." Do <u>not</u> say "nobody should be afraid to speak up." Speak to the situation of newness rather than "commanding" speaking up. Likewise, when a new person or people join an existing group, say something like "Because we have some people who haven't been with us long, they may feel hesitant to speak up. When you get to know me better, you'll see its okay." Make people comfortable to raise safety issues and share observations to keep the unit safe.
- Promote crew cohesion and stability. (People who are familiar with each other are more likely to feel comfortable to speak up, and to care about each other. More on how to do this later.)
- "Respectful interaction" should be promoted as the way in which queries and responses to queries are made.
- Supervisors should be ready to explain why a potential problem pointed out to them is not really a problem or has been superseded by another concern, where appropriate.

Implementation Strategy 4 – Use multiple means to convey the cultural change.

Communicating the change in culture needs to be done on many fronts in parallel, and repeated until the culture changes. Communicating a change about communicating gets a little tricky, but in this case the medium can literally be part of the message.

We have already mentioned using training to encourage dialogue (Strategy 1). Additional methods for communicating cultural change are as follows: Issue a directive or notice describing the desired changes, and change SOPs (see Strategy 5). Have Dispatchers and IMT members lead by example (after receiving training on the new communications approach themselves). Provide video and audiotape examples of real or simulated communications feedback (good and bad) for use in training, including refresher training. Tell funny, irreverent stories about lousy communications to reinforce learning points.[36] Use stories and case studies that examine problems, near misses, injuries, and entrapments caused by communication screw-ups.

Include interesting stories in internal newsletters, broadcast e-mail, and/or an employee magazine (like the air safety reporting newsletters "CallBack," "Safety Line," and "Flightfax"). A "quips and comments" or "overheard" column is likely to be widely read and is a good place to give examples that show the system listens and gives feedback on safety issues.

Implementation Strategy 5 – Establish communications protocols for tactical operations.

The agencies should establish communication protocols or standard operating procedures (SOPs) that explain the roles and responsibilities for communication tasks associated with various tactical operations. For example, there are specific communication requirements associated with a retardant drop. The pilot must make certain contacts and provide and receive certain information at specific times. The firefighter on the ground has responsibilities to communicate specific information either to the air tanker or lead plane at specific times. Who is responsible for what communication tasks should be deliberately taught in tactical and functional courses rather than as

[36] The British actor John Cleese (of Monty Python's Flying Circus fame) produced an excellent series of hilarious management training tapes. Cleese's approach uses the right tone, and provides an effective example.

communications training. Tactical communications should be treated like safety training: it should be part of each course, not a separate course.

Implementation Strategy 6 – Use CRM-like training.

Use a CRM-like approach in training people to function in the operational environment using the essential assertiveness and communication skills and the established communication protocols. Communications skills, developed early in the curriculum, should be consistently reinforced and applied in operational contexts throughout the curricula. All tactical or functional training should exercise the communications objectives listed above and achieve the following objectives through instruction reinforced by application exercises:

- What the operational roles and responsibilities are regarding communication
- What techniques work well to keep communication flowing in that environment and for that operation
- What common problems or communication barriers can be expected
- What devices and techniques can effectively mitigate these problems or barriers

Implementation Strategy 7 – Change the dialogue on the fireline through OJT and examples provided by supervision.

It may be hard to expeditiously reach the many people in the fire program who will not have had training that reflects the new communications concepts. To speed up the culture change, supervisors and dispatchers who are clued in to the change need to provide informal OJT and also to set an example. In other words, use lots of occasions to make incremental changes.

Supervisory performance on and off the fireline is a key to this important cultural change. The agencies must provide supervisors and fireline Incident Management Team members with clear expectations regarding their responsibility to make open, interactive and respectful communications a reality.

Implementation Strategy 8 – Provide instruction on use of radios and radio discipline.

Many fatality and entrapment reports raise questions about the adequacy of communication channels. The recommended changes in communications described above

will add a considerable load to the existing communication channel usage. Close tabs need to be kept on whether the recommended feedback is wisely used, and good radio discipline is maintained.

The agencies should train people to use the radio effectively and efficiently to communicate. Radio use training should be added to the existing curriculum. Logical locations in the curriculum include S-131 (Advanced Firefighter Training), S-200 (Initial Attack Incident Commander), and other mandatory courses that span the ICS functional areas (Command, Operations, Planning, Logistics and Finance). At a minimum, this training should cover radio discipline, message priorities, the duty cycle, standard phrases and protocols (already developed in ICS), formal acknowledgment, and the importance of closing the communication loop and links to CRM. This strategy should be implemented in concert with Goal 14, Goal 23, Goal 24, and the strategies listed above. These radio communication training objectives should be reinforced in simulated exercises throughout the training curricula (see Goal 14).

Goal 20. Information needed for safe operations and warnings should be transmitted up, down, and laterally within the organization at an incident (with positive feedback that the information is received and understood, as discussed in Goal 19).

In addition to clarifying information and having a dialogue, as discussed in Goal 19, it is necessary to make sure that key information affecting safety is communicated at the right times. People forget to mention certain things in briefings. Dispatchers and others sometimes forget to convey key information.

Implementation Strategy 1 – Improve the quality of briefings at incidents.

About one-third of the interviewees and respondents in Phase I felt that the quality of briefings (and planning meetings) they attended left something to be desired. Comments ranged from briefings with too little opportunity or encouragement for questions and discussion by Crew Supervisors, to briefings held in noisy, disruptive environments. Some Crew Supervisors said they often were either not allowed to speak, or were uncomfortable about raising questions about strategy during these meetings.[37] That meant they had less of a chance to clarify the instructions, and less chance to raise

[37] One senior fire manager who has been to hundreds of briefings said he never observed these conditions. Another saw many examples.

problems for consideration based on their knowledge of the terrain. Both can lead to safety problems.

There also was concern among Crew Supervisors and others that those coming off duty at the end of an operational period often did not even see, let alone help brief, those coming on duty. The briefing for the next period usually must take place before the previous one ends. (However, the debriefings are supposed to take place with planning staff, and any significant information is supposed to be passed on to the next operational period.)

Briefing guidelines already exist and are used by Incident Management Teams Division Supervisors, Agency Administrators and their staffs, but the guides need to be revised, and the practices they suggest need to be followed. A revised joint protocol for briefing resources assigned to incidents managed by Incident Management Teams should be adopted and carried out under the auspices of the NWCG. The intention is that improved standard briefing practices become an expectation and a reality. The agencies should implement the following revisions:

- The most basic requirement is to make sure people being briefed can hear, whatever the size of the briefing. That should go without saying, but we heard it mentioned too often not to think it is a widespread problem. Provide an adequate sound system for large briefing locations and require briefers to use it. Maintain audience discipline. (Several interviewers noted how quiet and easy it was to hear briefings by military units at fires.)
- Provide adequate space at the briefing location. Participants should be seated and have a clear view of the briefer. It is preferable for all people down to Crew Supervisor to hear the same briefing. Often there is no time to split the group and repeat the briefing twice; it would be preferable to find a good spot, and use a bullhorn if necessary. However, on occasion, it may be necessary to conduct separate concurrent briefings, perhaps dividing the group by divisions or functions. Smaller groups encourage interaction. On large fires, it already is supposed to work this way, with each division/group supervisor briefing his or her subordinates.
- Provide an adequate number of Incident Action Plans (IAP) to assure that they are widely distributed to all fireline supervisors, their assistants and single

resources. Make sure the IAP is of good quality and exact enough. Division assignments are particularly important to focus on.[38]

- Allow time and opportunities for interaction, questions, clarification, and feedback.

Implementation of this strategy will require that the agencies reevaluate their approach to the scheduling and conduct of incident briefings. Following this evaluation they should incorporate the new briefing guidelines into all appropriate training materials and the Fireline Handbook when they are completed. (Goal 15 also addressed briefing of "out-of-area" resources to familiarize them with a new environment.)

Implementation Strategy 2 – Develop and use checklists for transmission of information.

Checklists are simply a way to make sure you do not forget to pass on critical information. Most checklists should be considered a memory aid, and not necessarily a list you go through every time.

There is some disagreement on how well checklists are used today. Checklists and protocols should be established where not available for the types of information and the timing of that information that must be sent to various levels, most especially crews. The checklists should be incorporated into training, and provided in convenient, waterproof format to the positions needing them.

Checklists are needed for

- Size-up
- Briefing of Crew Supervisors and others during incidents
- Briefings of crews enroute and/or upon arrival
- Updates and briefings of crews during an incident
- Information exchange between operational periods (singled out as the worst information flow problem)

[38] We understand that one of the problems identified at the multi-fatality Dude fire in 1990 was that a division supervisor was not aware that the two crews who later took the casualties were assigned to his division.

- Dispatchers operational period change
- And possibly others

Some checklists already exist. The Forest Service response to the OSHA report on the South Canyon 14-fatality fire provided a seven item checklist for briefing personnel assigned to fires, as part of the proposed risk abatement plan. All checklists should be reviewed for clarity and completeness and whether there are unnecessary or not useful elements in them. The types of information that must be communicated with high reliability to ensure safety include the items in the following composite list:

- Weather
- Predicted fire behavior
- Fuel condition
- Special hazards or situations
- Overall strategy
- Tactics to implement the strategy
- Who is in charge
- Escape routes and safety zones
- Specific assignment and objectives for the operational period
- When requested resources will be available (or when they will be diverted)
- Where nearby crews are operating (e.g., whether two crews or other units are operating one above another on a slope)

This information may be obvious and already explicit in much of firefighter training, but it is not to be taken for granted that it is communicated to whom it should be, when it should be.

Some of this information is needed only one time for a particular incident (e.g., fuel type and condition); other information requires updates (e.g., weather, predicted fire behavior).

Policy needs to be set on whether crews should be given the training or assumed to have the ability to interpret the raw weather information or weather digests, or whether

advisories should be transmitted with instructions as to their implications and what to do. It is the difference between saying that: a) winds are expected to pick up to 35 mph, leaving it to the crew to interpret; or b) that winds are expected to pick up to 35 mph and in 30 minutes you may have to retreat from your section of the line. How much more burden do we want to put on Crew Supervisors?

The checklists suggested above might be used by two people together, either in person or at each end of a radio link. For example, the size-up of a fire might be conducted in a way similar to a cockpit check by a pilot in dialog with the co-pilot, using a written checklist of the items to be covered and two people confirming that they all have been covered.

As discussed earlier, people should be obliged to request clarification if they did not understand. It should be an obligation of Crew Supervisors to make sure they have received all the types of information they are supposed to be sent. It should be the obligation of the division supervisor or IMT to make sure that the information is sent and that people are receiving and processing the information they need from above and below.

Dispatchers

Dispatchers are gatekeepers of essential information, and as such, play a critically important role in the flow of information. Dispatchers make key decisions on resource allocation and deployment, keep Incident Commanders and Incident Management Teams informed of resource availability, and play a crucial role in situational awareness. The accuracy of information gathered by dispatchers influences their decision-making and the information they relay. The timeliness of the information affects the decisions of others. Initial attack dispatchers have the greatest influence over the safety of firefighters. Many people in the wildland fire business agree that dispatchers are generally underutilized as agents to improve safety.

Some dispatchers have no fire experience yet are called on to make important judgments and decisions. Some dispatchers were said to make decisions on resource allocations or other matters without being called on to do so. In other cases, firefighters who have been injured or have retired from field fire duty take dispatcher assignments but know little about dispatching.

Dispatchers also play a key role in fostering and facilitating "respectful interaction," and will play a key role in changing the communication processes and culture of the fire community. Dispatchers will be given primary responsibility for ensuring that people use the radio to communicate effectively and efficiently as the agencies move to bring discipline to their radio communications. The above considerations lead to the following goal:

Goal 21. Dispatchers are key nodes in the communication system and must be well-trained, well-informed during the incident, and must not exceed their authority.

Implementation Strategy 1 – Train dispatchers in the new approach to communications dialogue and in their role as change agents.

Dispatchers will be key players in changing the nature of communications. Their classroom and OJT training needs to incorporate the new communication practices discussed above under Goal 15 immediately. The dispatchers also need to help monitor communications and foster the changes by example and by direct advice and enforcement.

Implementation Strategy 2 – Improve recruiting and initial training of dispatchers.

Recruit experienced firefighters into initial and extended attack dispatching positions, and give them appropriate formal and on-the-job training in dispatching.

As part of revising dispatching procedures and training materials, study the dispatcher roles and methods in dispatching fire departments and emergency medical services (EMS), and adapt the strengths of those systems into the wildland fire dispatching scheme as appropriate.

Equipment and Personal Protective Gear

As a principle, all wildland firefighters and fire managers should be provided the equipment they need to do the fire job safely. Over time, affordable new technology should be considered for improving firefighter safety.

Most Federal wildland firefighters have satisfactory equipment, but there are some problem areas that affect safety, despite existing rules mandating the use of personal protective equipment (PPE) and ready access to that equipment.

Radio Equipment – Maintaining radio contact is critical to firefighter safety. Real-time communications with every crew and squad on the fireline must be assured. Contemporary firefighting strategies assume that firefighters have radios. However, limited numbers of radios, inadequate distribution of radios, and overloaded communication frequencies have all contributed to communication problems on some large fires under the control of Incident Management Teams. Many investigations of wildland firefighter fatalities have found problems in radio communication as a contributing factor. Some federal crews have been on the fireline with no radios for squad-to-squad communications, and sometimes with no radios at all. This problem is even more common with contracted fire engines, water tenders, and heavy equipment.

Agencies are finding that communication problems are exacerbated during interagency or intergovernmental operations. Firefighters from state agencies and local government, including volunteer and city firefighters, contribute to Federal firefighting efforts far more often today than they did just 10 years ago, and the trend is for that dependency to increase. It is essential that state, local, and Federal firefighters establish reliable, mutual communications to assure safe and efficient operations. As with many of the problem areas addressed in this report, this is a question of implementation – the policy exists.

Unfortunately, non-Federal firefighters frequently report to fire assignments lacking radios that are compatible with Federal agency systems, or with no radios at all. A review of the National Fire Equipment System (NFES) Fire Supplies and Equipment Catalog reveals an impressive array of communications equipment. The cache system can provide Command/Tactical and Logistics Radio Kits; Logistics, Command, and Backbone Repeater Kits; UHF, Military Low Band Link Kits; Satellite Systems; Electronic Key Service Phone Kits; Cellular Phone Kits; Radio Telephone Interconnects (RTI) Link Kits; and several aviation communication systems. The fire logistics system appears to have kept pace with developments in communication technology quite well, and the agencies have access to technologies that should address most of the communication problems reported from the field.

Furthermore, the fire logistics system possesses enough radios and other communications equipment overall to support the number of end users in total, and to adequately support national fire operations. In 1996 field staffing peaked at 24,000. Not

including local radio capacity, the national cache system contains 6,000 handheld radios, enough for one out every four of those persons to have been equipped with a radio if those radios were properly distributed. Since those 24,000 people included many individual firefighters, laborers, administrative positions, etc., the numbers of radios should have been more than adequate. However, reports from the field indicate that at least some Incident Management Teams still found radios in short supply and communication systems inadequate. Distribution and allocation problems appear to be contributing to this situation more than the total supply of radios.

Increasing radio communications may, in some cases, prove detrimental to firefighter safety rather than a benefit. By many accounts, firefighters are overusing the features of new generation radios, frequently scanning too many frequencies, receiving information they do not need and missing information they do. In addition, though firefighters cite a lack of frequencies as hampering fireline communications, it is likely that a lack of radio communication discipline may be contributing significantly to jammed channels.

Radio communications on initial and extended attack operations are even more problematic, as fire operations in the urban-wildland interface and interagency (including intergovernmental) operations have become much more common.[39] Frequently, multiple agencies respond simultaneously to incidents in their initial stages or as they extend. The responders often include local fire departments, law enforcement officers, emergency medical services, state natural resource agencies, disaster relief agencies, and others. This is particularly true in wildland-urban interface zones.

Fire operations can be very chaotic during initial attack and transition phases. Quite often, fire conditions are at their worst while organization is at its minimum. Experts interviewed during this study recognize initial and extended attack as the riskiest of fire operation environments. The absence of radio system compatibility frequently hampers communication and unified effort in these situations, intensifying the risks.

Other Equipment of non-Federal firefighters – Federal natural resource agencies are dependent, like never before, on state agency partners, local government firefighters,

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[39] The term "interagency" as used means "between Federal agencies" and also "between Federal, state, and local agencies."

emergency hire (AD) employees, contractors, and the military to carry out their fire suppression mission. A major reason for the dependency is that agency workforces are shrinking and their nature changing. Downsizing and budget cuts have reduced overall resources, and fewer agency employees participate in fire management activities. For example, as of 1995, only half (52 percent) of the permanent, full-time and temporary employees in the U.S. Forest Service were "Red Carded." This is a break from the past when fire was recognized as virtually everyone's duty [40]

During Phase I, we also uncovered many significant concerns about the lack of adequate equipment and personal protective gear of non-Federal firefighters who assist in Federal firefighting, as summarized below.

State Firefighters – Although many states run wildland firefighting operations using practices similar if not identical to Federal firefighters, there were many concerns expressed by Federal firefighters about the adequacy of equipment and protective clothing for state firefighters. About one-quarter of Federal firefighters surveyed felt that in their personal experience there often were equipment problems among state crews. The largest numbers expressing concern were in the following regions: the Southwest (52 percent), the West Great Basin (42), Northwest (39), Southeast (38), East Great Basin (37).

Local Volunteer Firefighters – Of even more concern than state firefighters were local firefighters. Over half of the Federal firefighters surveyed (57 percent) said that local volunteer personnel often did not have adequate equipment or protective clothing. There are wide extremes in the equipment of volunteer firefighters. Some are very well equipped, while others struggle to equip themselves for essential functions in their protection district.

More Southwest area respondents (78 percent) reported local volunteer personnel as not being adequately equipped than any other area. Other geographic areas where 60 percent or more of the survey respondents felt volunteers often lacked adequate wildland equipment or training were: Rocky Mountain, Great Basin, and Eastern Area. The areas with the lowest level of concern over volunteers equipment was the Northwest

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[40] USDA Forest Service Fire and Aviation Management, Course to the Future – Positioning Fire and Aviation Management, 1995.

and the South Zone of California, but even there about a third of respondents said lack of equipment was often a problem.

Private Contractors – Agencies used to use contractors primarily to provide specialized equipment including bulldozers and water tenders, or special services like catering or tree falling. However, as Federal and state agencies reduce their resources and fewer full-time and seasonal personnel are on the payroll, the agencies increasingly turn to contractors to fill gaps. Some firefighters interviewed said that occasionally there are unqualified operators coming along with some of the contracted equipment and some of the contracted equipment is of poor quality. Both can be dangerous. The majority of respondents felt it was only occasionally a problem. The strongest response came from BIA respondents, of whom over one-third thought this was often a problem. The above findings led to Goals 22 through 26.

Goal 22. All firefighters (on Federal fires) must be equipped with the personal protective equipment needed for their job (and the training to use it).

Implementation Strategy 1 – Broadcast and enforce a minimum standard for radios and personal protective equipment (PPE).

Individual firefighters, crews, fireline Incident Management Team, equipment operators, contractors, and support personnel should not be allowed to report to fireline assignments without meeting minimum PPE and communications equipment standards. This equipment can be assessed upon check-in (if not sooner). Resources found lacking should be required to stand down until they can be equipped. Anyone caught unequipped should be removed from the fireline. That these actions will be taken should be communicated to the entire non-Federal firefighting establishment, during the year, and again to particular units at the time assistance is requested.

Implementation Strategy 2 – Prepare for equipping non-Federal firefighters at incidents.

The agency and interagency logistical support systems must adapt to the changes and trends occurring in fire operations. Specifically, regional fire caches and logistics section chiefs must be prepared to augment non-Federal resources with PPE and radio communications equipment at fire locations, especially in the geographic areas known to have the worst problems. A system must be in place to supplement or equip non-Federal

firefighters prior to mobilization or as they arrive. To help implement the strategy, the agencies should adopt a universal system for arranging property loans and/or payroll deduction purchases for equipment. Under no circumstances should essential safety equipment be withheld and still expect state, local, or contract firefighters to assist.

Implementation Strategy 3 – Support funding for state and local fire units.

The Federal wildland fire community needs to support increased funding to state and local governments so that they may better equip themselves for the wildland fire mission. Current mechanisms for funding include the Rural Community Fire Program (RCFP) and Federal Excess Personal Property (FEPP) program. The five agencies should work with the states (through NWCG) and the General Services Administration (GSA) to streamline the disposal and acquisition of resources under the FEPP, and seek increased funding to cooperative fire programs, including RCFP, which have been drastically cut in recent years.[41]

In addition, especially in areas where dependence on local assistance is greatest, give Federal aid to municipal and volunteer fire departments to improve their preparation, as called for in the Federal Fire Policy Review.

Implementation Strategy 4 – Reinforce policy on carrying shelters.

For years, agency policy has mandated that firefighters carry fire shelters at incidents. The agencies have made extensive fire shelter training available since the early 1980s. Despite those efforts, reports from the field say that some Federal firefighters, including very experienced ones, routinely violate the policy and ignore their training.

The agencies should take affirmative steps, including disciplinary actions, to reinforce the policy that fire shelters are mandatory safety equipment. In addition, they should embark on an education campaign to reinforce several points:

1. That avoiding entrapment is expected of a professional wildland firefighter; a fire shelter is not a substitute for LCES, or the "10 and 18." Use your head and avoid the need to deploy your shelter. A fire shelter is to be used *only* as a

[41] At present, FEPP is administered by the USDA Forest Service alone, but the program can help local fire organizations that work with the DOI agencies as well.

last resort, not as a planned alternative. However, like a parachute, if you need one you'll be glad you have one.

2. Fire shelters work (as attested to by many deployment survivors).
3. Fire shelters are mandatory equipment.
4. You need to know how to get into a shelter under adverse conditions (winds, rough terrain).

The British Columbia (Canada) Forest Service employs a training course entitled "Fire Entrapment Avoidance and Shelter Deployment." The emphasis of this course is clearly on entrapment *avoidance first,* and then shelter deployment.

Goal 23. Every crew should have a continuous communications link to incident management and to nearby crews; this means having at least two radios in good working condition per crew.

In addition to the strategies discussed for Goal 22 above, the following strategies should be undertaken:

Implementation Strategy 1 – Improve distribution of radios, batteries, and other communication equipment.

Due to the expanding participation by non-Federal firefighters, there may be a need to provide more radios, more frequencies, more batteries, and more repeaters/links and to generally enhance communications support. The agencies should reevaluate the interagency radio cache network with the intent of maximizing its adequacy and responsiveness to current and future operational needs.

As noted earlier, the national cache system appears to have an adequate total number of radios to support fire operations nationally. However, the fact remains that firefighters are reporting to the fireline with inadequate communications equipment, and this is a serious matter. Either the distribution of radios needs to be improved or more radios added to caches in the regions that expressed the most serious distribution problems.

Also, regional fire caches should have enough radios so that radios can be "rented" to local government resources, contractors and other contracted resources not meeting communication requirements. "Rental fees" can be deducted from contract payments.

Implementation Strategy 2 – Establish new caches if necessary.

The agencies should identify the most common points from which large numbers of Type II crews are dispatched and establish radio caches at their mobilization points, so that Type II crews have radio capability when dispatched, to the extent possible. The Type II crews were by far those of most concern about being under-equipped. The agencies should consider mass purchases of inexpensive, but effective radios for intra-crew use.

The National Interagency Fire Center (NIFC) is already planning to improve the availability and access to standard command/tactical radios for inter-crew and Incident Management Team use by prepositioning command/tactical radio kits throughout the nation.

Implementation Strategy 3 – Mandate radios for each squad.

The agencies should mandate that all crews must have internal communication between its Squad Bosses, Crew Supervisors, and Crew Foremen, and "external" communications between the Crew Supervisor and his or her supervisor and the Incident Dispatcher or Communications Unit. This would require 3-5 "crew communication" radios and one frequency-changeable radio for the Crew Supervisor on a typical 20 person crew.[42] Preferably, resources should arrive at an incident with at least their intra-crew radios. Recognizing that this is not always possible, shortfalls in crew communications capabilities should be reported to the receiving incident at time of dispatch so that the incident may order radios appropriately.

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[42] The need for 3-5 radios comes from having 2 or 3 squads (and a crew foreman for Hotshots) per crew, each needing a radio, plus one for the Crew Supervisor, in addition to the frequency-changeable radio needed by the Crew Supervisor.

Implementation Strategy 4 – Assure adequacy of radios for mobile resources.

The agencies should mandate that all engines, water tenders and other mobile equipment have a frequency changeable radio in the apparatus when dispatched. Furthermore, engine crews should be equipped with at least one portable radio, either on dispatch or at the incident. Any shortfall in communications capabilities should be reported to the receiving incident at the time of dispatch so that the incident may order radios appropriately.

A great deal of fireline communication occurs over two-way radios. More than one-third of the survey respondents say distorted, cluttered, and jammed radio transmissions occur on most fires, and we believe it to be a serious safety matter. Inadequate radio communications have been cited as a factor contributing to confusion that led to the death of six firefighters on the Dude Fire in 1990.

Goal 24. The communications system used at fires needs to provide adequate channels, adequate clarity, and adequate reliability for communicating with all fire personnel, aircraft, and IMTs.

Implementation Strategy 1 – Periodically re-evaluate and improve communication channel capacity and reliability.

The agencies currently work with manufacturers, phone companies and other contractors to provide emergency communications capability. The agencies should explore various feasible options for expanding the current system of portable repeaters, cells, radios, and telephones, including joint planning efforts with the states, private entities, and non-traditional partners. Partnerships, including public/private alliances, should be pursued to share the costs of improving access and availability to an adequate network of cached communications equipment.

Implementation Strategy 2 – Move some of the communications load off the radio.

Use of telephone, radio telephone, computer and satellite technologies, and digital data communications can help move some communications off radio frequencies, thereby freeing-up frequencies and duty cycle time for tactical communications. Some would suggest that these technologies, particularly cellular telephones, are a simple and readily

accessible answer to the fire community's communication problems. However, use of these technologies requires planning and protocols. Some considerations:

- The use of portable telephone communication could lead to "free-lance" decisions outside the control of the Incident Management Team (for example, a Division Supervisor could contact his or her home unit via cell phone and order unauthorized additional resources).

- One-to-one telephone conversations are not appropriate for most fireline *tactical* communications, particularly since reliance on cell phones for tactical communications would limit the ability to rapidly disseminate emergency information to many. It is faster to broadcast by radio.

- Many logistical and administrative communications and some routine command communications do lend themselves well to non-radio transmission (for example, when the Operations Section Chief must contact the Division Supervisors to arrange the next day's resource needs).

- Sensitive communications (regarding personal emergency messages, critical incidents, etc.) lend themselves better to telephone (than radio) communication.

- Portable telephone cells, including Cells on Wheels (COW) and Cells on Light Truck (COLT) are available. However, they are not plentiful and are very expensive.

- Centrally located cellular phone kits (in NIFC or other fire caches) present problems with local area codes, local versus long distance calling and therefore costs. (For example, a phone programmed with a local Boise number, could make all calls long distance when used elsewhere.) Recently, Incident Management Teams have been procuring cellular phones locally. However, it is important that the system maintain the ability to provide larger numbers of phones than are locally available in a small town, using phones programmed with local numbers (either from caches or through contractors).

- Satellite phones currently provide the ability to talk by phone from almost any location without the need for cell access. Satellite phones are not currently very "field-user friendly," since many are the size of a laptop computer. However in the next 5 years the Motorola IRIDIUM system, for one, will provide handheld, "smart radios" that will roam between cell and satellite systems.

Accountability for Equipment Maintenance – Tool care and inspection are basic firefighter skills and supervisory responsibilities. However, the importance of these tasks seems to have diminished in the minds of some firefighters, squad bosses, and Crew Supervisors. About 20 percent of the survey respondents mentioned that equipment care was a problem. In the interviews, people raised concerns about equipment that had been inadequately refurbished at a regional fire cache before being dispatched again.

Goal 25. There should be accountability for keeping equipment well-maintained.

Implementation Strategy 1 – Describe equipment maintenance responsibility in basic courses.

The agencies (through the NWCG Training Working Team) should review the Firefighter, Advanced Firefighter, and Crew Supervisor training materials and Position Task Books to assure that equipment maintenance is adequately addressed in the materials, and that it is addressed in the courses.

Implementation Strategy 2 – Review and revise if necessary the qualifications of equipment specialists.

The agencies (through the NWCG Training and IOS Working Teams) should review the qualification requirements for equipment specialists working in the regional fire caches. Consider making training such as I-256 (Tool and Equipment Specialist) and I-255 (Equipment Manager) mandatory for fire cache specialists. Employees in supervisory positions at regional fire caches should be required to attend S-201 (Supervisory Concepts and Techniques) and S-301 (Leadership and Organizational Development).

Implementation Strategy 3 – Hold users and cache operators responsible.

As part of the stepped up attention to accountability that is to be a major new thrust of the culture, hold crews responsible for taking care of equipment, and for inspecting it and noting problems. They must also help by properly packing equipment being returned to caches, and must do so carefully, with the realization that the safety of other firefighters who will use the equipment again depends on them. Likewise, those at caches must be held accountable for inspecting and refurbishing equipment before sending it out again.

Aerial Reconnaissance to Improve Situational Awareness – Better awareness of the progress of a fire, where crews are located relative to the fire, locations of houses and infrastructure being threatened, and potential escape routes and safety areas can all clearly affect safety. Situational awareness will be discussed more in the next chapter; the hardware part of the problem is introduced here, to keep discussion of all equipment needs together.

The agencies have appropriately applied a wide variety of aerial surveillance and reconnaissance methods, including, aerial observation from fixed wing aircraft and helicopters, aerial photography, infrared (IR) sensing and imagery, Forward Looking Infrared Radar (FLIR), and the Global Positioning System (GPS). Representatives of the fireline Incident Management Team routinely observe fire conditions and operations from the air. It is not uncommon for the Operations Section Chief to "recon" a fire by helicopter two or three times per day.

However, there is still a sense that overall situational awareness and decision-making could be improved by further enhancing the "global" view that strategists and tacticians have of a fire. Of particular value would be aerial imagery providing "real time" information to fire managers. Increasing aerial imaging also carries the possibility of cultural consequences from Incident Management Team literally looking over firefighters' shoulders. Some firefighters are already distrustful of the management and IMTs. Many complain that tactical supervisors and Safety Officers spend too little time on the fireline and too much time at the incident base. Ultimately, the agencies need to try to gain the benefit of aerial imagery as a planning and briefing tool without creating the "rear echelon" culture despised by soldiers in Vietnam; that is, sitting back at the incident base and

making decisions placing firefighters in danger without walking the line and seeing the circumstances firsthand. The Incident Management Team still needs to leave the base and keep in tune with the line. [43]

Goal 26. Situational awareness should be improved by improving the ability of Crew Supervisors, Incident Management Teams, Incident Commanders and above to obtain overhead views of the fire, including data from infrared and possibly other sensors.

Each of the strategies outlined below also present opportunities for getting better information to improve the quality of fireline briefings, and should be implemented in concert with the strategies of Goal 20.

Implementation Strategy 1 – Use satellite imagery.

Low earth orbit satellite imagery is now available for civilian use. Satellite imagery can be used by the Planning Section to more accurately evaluate the fire situation in real time or otherwise, and as a powerful briefing tool. The Incident Commander, along with the Operations and Planning Sections, could use the imagery to plan overall strategy. The Logistics Section could use the information to plan safe and efficient transportation routes and drop points. This all is done sometimes, but not nearly enough.

Implementation Strategy 2 – Use real time air-to-ground and ground-to-air-to-ground video.

The agencies should explore options for "real time video" observation that transmits images back to the Incident Command Post. This could enable all Incident Management Team members to observe fireline conditions, and improve their situational awareness without exposure to the risks associated with helicopter flight. It also would improve their ability to keep track of the location and status of their personnel.[44] Video cameras might be mounted on helicopters carrying minimal flight crew or only those personnel essential to the reconnaissance flight.

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[43] Another solution to consider, besides providing better imagery, was proposed by a member of the FFAST Team: assign three operations section chiefs to an IMT; one would do strategic planning and the other two work 12-hour shifts to maintain a current, in-the-field, big picture view of tactical activities.

[44] Losing track of the location of crews and who is assigned to supervise them has been a contributing factor to some multi-fatality fires, e.g., the 1990 Dude Fire.

Likewise, there are now relatively low-cost ground-to-air and ground-to-air-to-ground technology for transmitting images. Cameras mounted near a fire front could show those higher up the chain (and the media and political leaders) what is being faced.[45]

Implementation Strategy 3 – Use aerial drones.

The U.S. Army employs drones, now called unmanned aerial vehicles (UAV), for low risk battlefield reconnaissance. One military model is essentially a 23-foot model airplane carrying television and night-penetrating thermal imaging cameras. UAVs of this type represent a potentially outstanding technological opportunity for wildland fire managers. The agencies should pursue application of this technology; there are already UAVs available on the market.

Transportation

Effective wildland fire management hinges on the ability to quickly and effectively move people and material, sometimes in great quantity. Firefighters and their support resources must travel to fire locations that are often in remote areas quickly and in a condition that allows them to deploy and go to work immediately. Once on site, firefighters, their supervisors and their equipment must be moved back and forth to fireline assignments, typically over rugged and often inaccessible terrain. Often, hundreds of people and tons of supplies and equipment are moved each day by helicopter. Once the fire is extinguished, the transportation process begins anew as firefighters, support staff, and their accumulated support equipment rapidly demobilize.

The United States wildland fire community currently depends upon a doctrine of total mobility. Federal agencies mobilize fire control resources from throughout the nation to respond to large fires and critical situations. It is quite common for firefighters to take assignments in several states during one fire season. During active fire seasons, thousands of firefighters are moved throughout the country. It is not unusual to have 10,000 to 15,000 firefighters afield simultaneously.

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[45] The concept has been proven. One example with which we are familiar is the TacLink system developed by System Planning Corporation (our parent company) for sending imagery to and from helicopters/ aircraft and the ground. There are probably others.

The shrinking pool of Federal employees available to fight fire makes it all the more important to quickly assemble and transport firefighters. Effective transportation during mobilization efforts also reduces fatigue.

Fire mobilization employs commercial airliners and other transport aircraft large and small, and long distance highway travel in commercial, contracted, and agency vehicles. All have their associated risks, however, few firefighters have expressed concern with the safety of this type of transportation. On the other hand, there is much concern over fatigue as a major safety factor and the potential to reduce it using better transportation (as will be further discussed in Chapter 5 on Human Factors).

Transportation at the fire site is more problematic. Once they arrive at a fire, firefighters are transported to their assignments by riding in trucks, buses, and helicopters; parachuting from planes; rappelling from helicopters; or trudging long distances on foot. Air transportation (mostly helicopter operations) received high marks and few complaints. Ground transportation was another matter. In the past, the National Guard or Army Reserve commonly transported fire crews to fireline assignments in fire personnel transports and other large military vehicles (even dump trucks). However, this mode of transportation was largely abandoned following high profile accidents in which firefighters were killed when these open trucks rolled-over. Since then, school busses have provided most localized transportation services.

Unfortunately, nearly three quarters of the survey respondents in this study cited the inexperience of bus drivers as a safety problem and one third thought it was a major safety problem. Numerous firefighters complained about the safety of school busses driven along logging or fire roads by inexperienced drivers. An experienced Crew Supervisor said the bus trip to the fire was usually scarier than the fire itself.

In addition, people have questioned whether school buses represent the most appropriate mode of fireline transportation. They require good roads and large spaces to turn around. Frequently, busses can only get to pickup and drop off points that still leave firefighters long distances to walk before or after arduous fireline construction operational periods. Also, school bus availability becomes a problem when fire activity reaches its peak after schools return to session in the fall, which seems to have become more common.

Whether considering long-distance or local transit, transportation planners and managers walk a fine line, managing trade-offs between cost, safety, and fatigue. Helicopter transportation alleviates firefighters from long walk-ins, but raises costs and exposes large numbers of people to the risks of helicopter flight. However, rested firefighters are not only safer, but more effective. The ideal is to have a safe transportation system that minimizes fatigue and is cost-effective, which leads to the following goals.

Goal 27. Crews, teams, and individuals should be transported where needed with attention to net risk reduction and with consideration of reducing fatigue.

Implementation Strategy 1 – Give more weight to risk reduction, especially reduction of fatigue.

The agencies should revise their approach to mobilization, demobilization, and fireline transport, mandating that firefighters will be transported by the safest, quickest and most effective mode of transportation, not necessarily the least expensive. The relationship between fatigue and safety is not always thought about when planning transportation.

Implementation Strategy 2 – Explore use of safer ground transportation.

In the past, the agencies explored options for installing crew compartments and/or roll-over protections systems (ROPS) in transport vehicles. The agencies should re-instigate these or other efforts to find a cost-effective means of providing safer crew transport in vehicles. Crew personnel should be seated and belted in. The intent is not necessarily to replace bus transportation, but to supplement it at least in the most dangerous terrain. Ultimately, Incident Management Teams would draw from both modes, using each where appropriate.

Implementation Strategy 3 – Use computerized transportation scheduling.

The agencies should use computerized scheduling tools to plan and schedule mobilization, demobilization and tactical transportation. The intent is to match passengers to available transportation resources, move passengers as quickly and efficiently as possible, and minimize fatiguing and unproductive "down time." Necessary transportation down time should be used productively to provide "tailgate" training sessions, safety

meetings and enhanced briefings, which will be productive and will also reduce the perception of wasted time.

Goal 28. All transportation drivers should have adequate experience and training.

Implementation Strategy 1 – Increase requirements and realism for training of bus drivers and other drivers.

If not already experienced and in possession of a successful fireline performance evaluation, passenger-carrying transportation drivers should be trained for fireline conditions before beginning service. As part of the training, drivers must be oriented to the conditions under which they will be operating: unpaved, narrow roads; smoke/poor visibility; tight turnarounds; congested loading and unloading; fatigue; etc.

In addition, drivers must receive formal training that orients them to their relationship to fireline Incident Management Team, their role in the operation, and their impact on firefighters. Drivers must also receive training on appropriate fireline survival skills, including fire shelter use and recognizing danger or situational awareness. This training must be effective, but brief, possibly no longer than two hours of formal training. Drivers should be trained at the point of hire, and trained drivers provided to the incident whenever possible, though some training may have to happen at the incident (orientation to conditions and "check rides," for example).[46]

The above conditions can be made part of the transportation contract (if the service is not provided in-house.) The agencies might contract out the development of the training, too, so that the NIFC Division of Training can focus on larger, more complex training needs associated with the goals of this study.

Implementation Strategy 2 – Hold drivers accountable.

Reckless driving, falling asleep at the wheel, DWI, and other potentially life-threatening actions should be dealt with swiftly and severely. Drivers who cause injuries through their negligence should be prosecuted.

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[46] A "check ride" is aviation talk for a flight in which a pilot demonstrates his or her capability to a ride-along observer.

Medical Evacuation – A specialized form of transportation of great importance to firefighters is medical evacuation of the injured. Injured firefighters are often under mental stress in addition to their physical injuries, and deserve rapid evacuation and transport to medical facilities. Some firefighters who were interviewed one-on-one raised issues regarding timely medical evacuation. However, very few survey respondents reported problems with the prompt rescue of injured firefighters. A few of the complaints dealt with situations where progress in receiving medical care was slowed by the need to complete paperwork. Only a few people raised this paperwork issue, and it was not for major injuries. Some experienced observers reported that medical evacuation procedures were not clear under the agencies' application of the Incident Command System; there can be confusion about who is in charge when a firefighter is injured.

Goal 29. Injured firefighters should be speedily rescued.

Implementation Strategy 1 – Appoint a task group to review evacuation procedures and the associated paperwork, and consider a model evacuation plan.

The agencies (through the auspices of the NWCG) should appoint a special task group to examine the procedures used by Incident Management Teams to evacuate, transport, obtain medical attention, and process necessary paperwork when a firefighter is injured. As part of their charge, the task group should examine agency and interagency administrative and paperwork requirements, and make recommendations to streamline processing and ensure that it does not delay evacuation or treatment of the injured.

Reports from the field suggest that protocols and performance vary widely, with some Incident Management Teams implementing very effective accident action plans while others have delayed prompt medical evacuation of injured firefighters.

The task group may consider the following model, which was developed and successfully used by a Type II Incident Management Team.[47] Two experienced Operations Section Chiefs, one qualified and experienced as a Medical Unit Leader and Aid Station Specialist, developed the plan.

[47] The interagency team included Mike DeGrosky, a co-author of this report, who with Jerry Anderson (FS), developed the model plan, working under Incident Commander Herb Spradlin (FS).

MODEL ACCIDENT ACTION PLAN – TYPE II TEAM

The **IC** holds ultimate responsibility for the team's actions in case of an accident.

Simple evacuation/non-fatality

For medical evacuations involving one or two victims, the Medical Evacuation Plan in the Incident Action Plan (IAP) shall be followed. **The Operations Section Chief** and **Safety Officer** will immediately meet with the **Medical Unit Leader** and provide assistance as necessary.

Multiple injury/fatality/shelter deployment

When an accident occurs which involves multiple victims, a fatality, shelter deployment, or other event not covered by the Medical Evacuation Plan, the **Division or Group Supervisor** shall go directly to the scene to take control of the situation. Treatment and evacuation of the victim(s) shall be per the Medical Evacuation Plan. The **Division or Group Supervisor** is responsible for ensuring that the MedEvac Plan is implemented at the scene.

The **Operations Chief** and **Safety Officer** will go directly to the scene. Immediate and clear communication must be established between the **Operations Chief** and the **Division or Group Supervisor** to determine who can arrive at the scene quickest and establish control of the situation.

Upon arrival at the accident scene, the responsible party **(Division/Group Supervisor or Operations Chief)** will take immediate action to move all unnecessary personnel from the scene. These personnel will return to suppression activities or return to base.

If the **Operations Chief** is unavailable to respond to the accident scene, the **Safety Officer** will carry out the Operations Chief's responsibilities.

The **Emergency Medical Technician (EMT)** on the scene will hold responsibility for emergency treatment and movement of victims, but the **Operations Section** is responsible for overall control of the accident scene.

The **Communications Unit Leader** will take immediate action to clear all radio traffic on the incident until such a time that they have provided clear channels to handle the emergency traffic.

The **Incident Commander**, **Planning Section Chief**, **Logistics Section Chief**, **Finance Section Chief** and **Information Officer** (or their Deputy) will meet the **Medical Unit Leader** at the Communications Unit and stage all accident actions from that point. The **Planning Section Chief** will assure that an individual is assigned to document all communications regarding the accident. Only those personnel who are essential to the accident operation or communications will be allowed in this area. All team members involved in accident related duties will insure that they have appointed a Deputy or "Acting" to carry out their regular duties.

The **Logistics Section Chief** will immediately close all communications out of base except those necessary for the accident operations.

The **Planning Section Chief** will contact the **Agency Administrator**, who will notify appropriate agency personnel. If the accident involves a fatality, the **Agency Administrator** will contact the **County Sheriff**, **Coroner**, and **the victim's home agency**.

The **Planning Section Chief** will consult with the **IC** and other team members to determine the need for a Critical Incident Stress Debriefing (CISD) Team.

AT NO TIME DURING THE ACCIDENT/FATALITY EVACUATION PROCESS WILL THE NAME OF THE VICTIM BE USED OVER RADIO COMMUNICATIONS. NO INFORMATION REGARDING THE ACCIDENT/FATALITY WILL BE RELEASED TO THE MEDIA OR PUBLIC WITHOUT THE APPROVAL OF THE INCIDENT COMMANDER. ALL PUBLIC INFORMATION WILL BE RELEASED THROUGH THE **INFORMATION OFFICER**.[48]

Approved by – _____

Incident Commander **Date**

Implementation Strategy 2 – Reduce evacuation needs by improving on-site care.

For routine medical emergencies and illness, on-site medical care can eliminate delays and expense associated with medical evacuation. In also reduces the number of people who have to leave, and improves the level of care. The benefits of front line health services have been successfully demonstrated in a ground-breaking pilot program in Ontario, Canada. The Ontario Ministry of Natural Resources provides advanced health services to incident bases by contracting with Registered Nurses who work under the

[48] Contacts with media require authorization by the agency sponsoring the fire. This example would have required a delegation of authority to be consistent with policy.

supervision of medical doctors. The health services are fully integrated into the fire operation. The Federal agencies should consider implementing a similar program for fires that have a Medical Unit established (almost all project fires), possibly using RNs, Nurse-Practitioners, or Physician's Assistants as Medical Unit Leaders. At least one agency (BIA) said they already routinely hired nurses, EMTs, or physician's aides for this purpose.

Summary

Chapter 3 has examined a wide range of attributes of organizational culture, including preserving strengths, safety attitudes, reporting safety incidents, ability to refuse assignments, protecting non-Federal as well as Federal employees, accountability, experience levels, training, certification, interpersonal communications, the dispatchers' role, use of technology (equipment and personal gear, surveillance, and transportation), and equity across ethnic and gender groups. While many of these areas are generally in good shape, the above recommendations should make a significant improvement in safety, especially over the long run.

The next chapter focuses on another topic of critical importance to safety: leadership.

CHAPTER 4. LEADERSHIP AND FIRE MANAGEMENT

Leadership is discussed in two senses in this study: "the group of leaders" and "the act of leading people." This chapter discusses goals related to the leadership or management of fire programs that were not covered under organizational culture. Leadership training is discussed in the next chapter.

We define wildland fire leadership here as all ranks above squad boss, including crew supervisors, division supervisors, operations section chiefs, other Incident Management Team members, Incident Commanders, fire management officers, Agency Administrators, and fire directors.

The act of leadership has been defined in several ways:

> *Leadership* is the process of influencing individual and group motivation.[1]
>
> *Leadership* is the activity of influencing people to strive willingly for a group of objectives.
>
> *Leadership* is then interpersonal influence exercised in a situation and directed through the communication process, toward the attainment of a specialized goal or goals.[2]

One fire leader described leadership as "getting people to do the right thing."

An organization's culture is determined in many ways by its leadership, and the leadership is in turn shaped by the culture. The leadership of the Federal natural resource agencies must set the tone for safety by example and by emphasizing safety policy. The leaders must have the training and experience to influence people's behavior, make appropriate decisions and to function effectively under stress. Leaders must provide a professional role model of what can be attained through training and experience.

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[1] James Higgins, and Julian W Vincze, *Strategic Management – Text and Cases,* 5th Ed., Harcourt Brace Jovanovich College Publishers, 1993.

[2] Paul Hersey and K. Blanchard, *Management of Organizational Behavior - Utilizing Human Resources,* 5th Ed., Prentice Hall, 1988.

A critical function of leadership is the creation, management and sometimes the destruction of organizational culture.[3] To change firefighter safety culture will require the leadership in each of the five agencies to be involved and support the change, if the agencies are to influence the behavior of firefighters and their safety.

The leadership issues discussed in this chapter cover a wide range of topics, including fire management policy, proper use of crews, strategy and tactics, leadership experience, competency requirements, briefings and plans, accountability, and crisis leadership. Some of these issues could have been put in the chapters on organizational culture or human factors. Many of the goals are highly interrelated. The overriding principle here is assuming that leadership is well-qualified and well-trained.

Fire Management Policy

Agency fire management policy bears directly on the safety of firefighters. Some of the greatest dangers to firefighters arise from inadequate or unclear policy, and especially the lack of consistent implementation of policy. Some policies are not well-distributed and are not well-known or well-understood. The adoption of a policy change does not mean that all will start abiding by it without there being provision for its widespread and clear communication.

Observations from the field suggest that there also may be a growing dissociation between firefighters, Incident Management Team and agency safety policy; what happens at the grassroots level may not be consistent with policy, e.g., on firefighting involving structures, or on safety practices, as will be discussed further.

Resource Allocation – Several senior wildland fire managers we interviewed felt that there was a need to improve on strategic resource allocation decisions during busy fire seasons. Agency fire managers must determine priorities among fires when resources are heavily committed and in short supply. These decisions can directly impact firefighter safety.

Some fire managers suggested a flexible decision-making approach, incorporating fire behavior and growth prediction models as is done today, but allowing managers more freedom to revise priorities. This flexibility would include the ability to decide whether an agency would continue suppression efforts on a given fire, or not initiate suppression action at all. In addition,

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[3] Edgar H. Schein, *Organizational Culture and Leadership* 2nd Ed., San Francisco, Jossey-Bass, 1992.

Phase I participants raised the concern that fire suppression strategy and control objectives too often assume that the tactical resources that have been ordered will be available, though in reality, they may not arrive, or may arrive much later than desired. When representatives of the Incident Management Team continue to pursue strategies that require more resources than are available, what initially may appear to be a reasonable strategy or tactic can become a dangerous one. Some senior managers commented that there was adequate flexibility in current policy, but that the flexibility might not be understood, believed, or used; i.e., there was inadequate communication, poor performance, or both.

Additionally, the cadre of resources available for firefighting include personnel for whom fire is a secondary, not primary, responsibility. This "militia" is a mainstay of the firefighting program, trained and ready to be used. However, with general decreases in bureau budgets, the cadre of wildland fire militia is shrinking. Those remaining are not always permitted to take (or do not accept) fire assignments because there is no backup for their primary work responsibilities.

At a national level, decreased funding and resources, and rising costs mean that the expectations of the public, congress, and Agency Administrators must be adapted to reflect changes in budget allocations and resources.

Policy Disagreements – Some respondents felt that disagreements over policy, priorities, strategy and tactics among multiple Federal and state agencies can be a safety problem, such as when two or more agencies clash over decisions to protect residential structures at the expense of natural resources. Frequently, firefighters and the Incident Management Team are heard to question the sense in putting firefighters at risk to stop a fire from burning low value resources or a fire that might actually be doing some ecological good, or because of civilians who build in harm's way either knowingly or unknowingly. A relatively small number of people raised these issues, but they are known to have been the root of some high profile, controversial strategic and tactical decisions.

Some firefighters unhappy with the state of safety on the fireline are formulating ad hoc safety policy, often right on the fireline. One Hot shot crew may have a different version of what is safe and sane from another Hot shot crew. Unfortunately, some informal approaches to fireline safety policy and confusion about safety policy are associated with tragic fireline incidents.

Some firefighters report that they are asked to implement tactics that unnecessarily endanger them. Participants in Phase I spoke of times when public pressure, the value of homes or property or a "gung-ho" attitude placed them at greater risk, even though agency policies place firefighter safety above the conservation of resources and values to be protected. Firefighting is inherently dangerous and it is hard to draw a solid line between "normal" danger and "excessive" danger. Firefighters observe that they willingly take more risks to protect homes or ecologically valuable lands, sometimes to their own detriment, and this motivation is recognized and sometimes exploited by the Incident Management Team.

Wildland-Urban Interface – Survey respondents said the need to improve Federal policy relating to the wildland-urban interface was one of their strongest concerns. Current Federal policy prevents Federal wildland firefighters from engaging in interior structural fire suppression when wildland fires extend into the residential environment or "interface." Federal wildland firefighters do not have the equipment, training, or mandate to extinguish structure fires resulting from extension of the wildland fire, though they can try to stop the fire from reaching structures, and do limited extinguishment from outside the structure. Federal policy recognizes firefighting within structures as a responsibility of local government, with the exception of structures in national parks. However, the wildland-urban population is growing rapidly, and wildland firefighters more and more often find themselves in the interface environment, providing "structure protection" or keeping the wildland fire from reaching the structures.

The above findings led to Goals 30 through 33.

Goal 30. Set firefighting goals commensurate with available resources.

Implementation Strategy 1 – Use the "Wildland Fire Situation Analysis" approach or others to evaluate fire control strategies and select the best commensurate with available resources.

The agencies have built the ability to re-evaluate fire control objectives and strategies in light of resource shortages into the new Wildland Fire Situation Analysis (WFSA) document, which is used by Agency Administrators to evaluate alternative fire control strategies. Policy mandates that the WFSA be used as a step in the process of deciding on a strategy. The issue is to use it well, and follow through.

The agencies should work with the NWCG to appoint an interagency task group to evaluate the influence of the WFSA on firefighter safety. The task group should evaluate the WFSA approach and the materials used to provide training and support on it to ensure that

Agency Administrators use the WFSA well, and adequately provide for firefighter safety when they evaluate fire control alternatives. Feedback in the form of examples or case studies should be sought to reinforce the concept embodied in this goal.

Implementation Strategy 2 – Encourage regional and national fire managers to be more flexible and to revise priorities in real time during a season, when necessary.

Some priorities are set by predetermined national policy ("when we are at this mobilization level we do that"). This can lead to some fires being fought that could have been let go. Also, some fires that are fought are not given high national priority, and hence not enough resources. The agencies' policies generally do allow regional and national fire managers freedom to re-evaluate and revise fire control priorities, on a fire by fire basis, but the flexibility may not always be understood or exercised. The flexibility in decision-making should include the ability to decide whether to continue or discontinue suppression efforts on a given fire, or not initiate suppression action at all. The strategy here is to make sure that fire managers understand the envelope of practice they have, and training them on when and how to exercise that flexibility.

The agencies should encourage local and regional administrators to exercise the latitude they have to make the decision not to risk personnel to control fires on lands with low values to be protected or where fire will provide ecosystem benefits. Policy revised in 1995 said that everyone should have a plan for the acreage they are responsible for. There is flexibility in developing and revising the plan.

Implementation Strategy 3 – Provide adequate fire management training to Agency Administrators, and to encourage them to exercise more discretion to enhance safety.

It is particularly important that Agency Administrators who do not have a fire background not inadvertently set unreasonably hazardous objectives for fighting a fire. This ties into their need for at least some fire management training (discussed later in this chapter).

Goal 31. Do not fight fires in a way that will endanger firefighters, regardless of the values to be protected.

Implementation Strategy 1– Ensure that this goal is emphasized in strategic and tactical fire courses.

The agencies should use training opportunities to reinforce the concept that many factors must be weighed in the strategic and tactical decision making process, and that primary among them is the factor of firefighter safety.

There are, perhaps, two aspects of this change. First is recognition of the fact that direct consideration of safety issues needs to be a part of all courses.[4] Second, the agencies should research and develop common sense protocols to evaluate safety, as well as production aspects of different strategies and tactics. The evaluation of the safety aspects of strategic alternatives may prove to be different from the safety aspects of tactical decisions. The evaluations need to be simple, quick, easy to use – probably not black box computer applications. They need to be intuitive tools that help decision-makers frame situations, identify critical safety impacts and quickly compare alternative actions for efficiency in mitigating potential safety threats.

There will be separate safety evaluation protocols for Agency Administrators who issue delegation of authority, for IMTs preparing incident action plans, and for crews on fireline assignments.

Implementation Strategy 2 – Do not allow constraints on firefighting approach due to ecological considerations to interfere with safe protocols.

Firefighters must not be put in danger as a result of ecological constraints or objectives. Safety takes precedence, and firefighters should be withdrawn when ecological factors are likely to interfere with safety considerations. Firefighters must be confident that sufficient risk management controls are in place (e.g., effective escape routes, safety zones, and control applications) before implementing "light on the land," "light hand," or Minimum Impact Suppression Tactics (MIST). Particular concern must be applied when the Haines Hazard Index is in the 5-6 range and MIST practices are being used.

Implementation Strategy 3 – Do not permit structural firefighting by firefighters not trained for it; clarify and support their role.

The agencies need to clarify and communicate to all Federal firefighters the comprehensive policy regarding structure fire suppression and protection. There are some

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[4] The new Firefighter Fatality Case Studies course and others under consideration by the Safety and Health Working Team may provide materials or modules to be used in various courses or to be self-standing.

unique differences that exist between agencies; e.g., the NPS has structure fire protection responsibility in park system units; in California, FS engines carry breathing apparatus. Federal policy needs to be clear regarding these differences, and the roles and responsibilities of Federal firefighters when structures are involved by fires in the wildland-urban interface. Present policy makes it clear that Federal firefighters not trained in structural firefighting should not engage in an interior attack; even if trained, they should not be fighting fires within private homes. The effort to establish and clarify this policy must involve the participation of the agencies' non-Federal partners, particularly the state fire agencies.

If the Federal wildland firefighting policy is to stay out of direct structural fire suppression and only protect structures indirectly, there needs to be political backing of firefighters on this policy by the leadership within and outside the fire program. The Federal firefighters sometimes feel pressured to assist in any way they can when a home or other structure is burning. Homeowners and local fire departments need to understand the Federal policy, too, as discussed under public education in Chapter 6. (See also the related discussion of Goal 70 teaching firefighters the basics on interface hazards.)

Goal 32. The strategy and tactics of fighting a fire must be flexible and periodically reconsider the available resources and the changing situation.

Implementation Strategy 1 – Train and evaluate fire managers in being flexible and readjusting strategy and tactics as needed.

It is important not to lock in on the first strategy or tactics selected, and then not change no matter what. Sometimes one may have to switch from an offensive to defensive mode or vice versa. The strategy or tactics for a fire should not simply be stated once and for all, and then implemented as best as possible using existing resources. Changing availability of resources and failure of resources to appear as scheduled may necessitate modification of strategy and tactics. Not having enough resources may not only doom a strategy but may also unnecessarily endanger firefighters.

Strategy and tactics are selected using a hierarchical approach. Agency Administrators provide direction that leads to defining incident objectives, which in turn leads to a choice of strategy, and then the tactics and resources required to implement the tactics. When things are not working out, you are supposed to go back up the chain, analyzing each step to see what needs to be revised. A flexible viewpoint is needed at each step, but one does not immediately change strategy if the tactics are not working.

Retaining flexibility not only permits decision-makers to re-evaluate the safety risk, but also improves efficiency of operations. (See also related Goal 20, on legitimizing querying of tactics by subordinates, and Goal 30, Strategies 1, 2, and 3, on allowing flexibility).

Use of Fire Models[5] – Strategies for dealing with complex wildfires and prescribed fires can cause significant disruption of human activities, affect the health and welfare of citizens and firefighters, determine the allocation and movement of scarce firefighting resources, and involve the expenditure of millions of dollars.

Drought conditions, multiple fires, extreme fire behavior, the intermix of homes and wildland fuels, forest health decline and concerns for firefighter safety have challenged fire managers in the 1980s and 1990s, and require the best models to help develop appropriate strategies and tactics. Increasingly managers want to base strategies on long-range predictions of fire behavior – 30 or more days into the future. This is a difficult task to undertake successfully in the uncertain world of fire weather and fire behavior forecasting, but there were several examples in the 1994 fire season where such projections were helpful to decision-makers on wildfires in Colorado, Idaho, Washington, and Montana.

Computer programs that have been developed to aid the long-range projection process include FIRES (Fire Information Retrieval and Evaluation System), RERAP (Rare Event Risk Assessment Process), and FARSITE (Fire Area Simulator). A critical step in the selection of appropriate modeling approaches and programs is for the assessment team and the requesting officials to agree on an objective for the assessment. The objective must be tailored to the circumstances of the fire situation and the manager's concerns.

Long-range projections have been developed for three different types of fire situations: potential growth of large escaped fires, regional fire assessments regarding multiple fires, and growth behavior of fires that can produce benefits to environmental resources. In requesting the assistance of a long-range projection team, managers want to minimize future surprises through an understanding of probable rates of spread, fire intensities, and direction of fire spread. Also of interest are estimates of season-slowing or season-ending precipitation events.

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[5] We thought this topic should be in the group here rather than by itself under the heading Ecological Considerations, where it was in the Phase II report.

Goal 33. Long-term fire growth assessment models should be used in making decisions on fire management strategy.

Implementation Strategy 1 – Prepare ahead of time for use of models.

Agencies must prepare in advance for the use of models by providing a source of experts trained in long-range projection methods, ensuring that necessary fuels and fire behavior information and maps are prepared in advance, and that Agency Administrators are briefed regarding their responsibilities in the process. This, once again, is a practice done in some agencies some times, but it needs to be done more broadly.

When requesting a long-range fire behavior projection, it is generally best to order a team of specialists including a fire weather forecaster, one or more fire behavior analysts and a fire suppression operations specialist or prescribed fire specialist. It also is important at the outset to establish the objectives, assumptions, and probabilities upon which the assessment will be based.

Objectives should be negotiated between the requesting unit and the team to ensure that the assignment is feasible. Once the objectives have been determined, the team will be able to select the most appropriate modeling approaches.

The requesting official and the long-range projection team must define reasonable expectations at the outset, so that there is a common understanding of products to be produced: For example:

1. Define assessment periods in terms of 6-10 days, 10-30 days, and >30 days. The 1-5 day assessments are best left to the Fire Behavior Analysts on individual fires.

2. Define fire weather and fire behavior assessments in terms of probabilities or estimates, not as absolute numbers.

3. Determine fire spread directions, not fire perimeters.

4. Revise assessments every 3-5 days, or as conditions change.

5. Complete the long-range assessment in a timely manner (within 2-3 days).

6. Make assessments for at least two scenarios: worst case and more probable case (define assumptions for each case).

7. Match assessment objectives with methods to achieve appropriate resolution (danger rating models versus fire behavior models).

8. Circulate the long-range fire behavior assessment report widely after the final briefing of results.

Based on recent experiences, it can be concluded that the use of long-range fire behavior projections can be a helpful adjunct to decision making. But it must be recognized that fire growth simulation models are designed to assist in decision making. Models provide data analysis and information to the decision-maker. People, not models, will make the final decisions regarding strategies and tactics.

Implementation Strategy 2 – Use fire growth models in real time to establish priorities.

While there is danger to firefighters from fires of all sizes, one of the most dangerous times is the transition of a fire from a small one that can be fought with initial attack resources, to a larger one requiring more resources and a change in Incident Commander. As resources build up, and as the Incident Command System expands to meet greater complexity, there can be a danger period. Once a fire gets large, there are many opportunities for accidents. Therefore, predicting possible blowups and stopping them from occurring can be important to safety as well as ecology.

Ideally, fire models are used ahead of time to develop plans for fighting fires. The suggestion was made by some senior fire managers to also use the models in real time during the fire season to make further decisions about which fires to monitor and which to fight, and to evaluate whether the planned strategy will work.

Some fires give no room for options due to the values to be protected or a combination of other factors. However, in times of limited capabilities, we need to be able to assess which fires need attention, how much, and how fast. This is a general principal, applicable even where there are no critical ecological concerns. The key is to focus on a realistic analysis of the probabilities that the action will be effective, and to identify the potential consequences if the action fails. The "action" may include monitoring a fire but not committing resources to fight it.

Strategy and Tactics

This section discusses a variety of strategy and tactics issues raised in Phase I as important to safety. They are only loosely connected, but each is individually important to safety. There is a brief recap of the problem followed by the goal and the implementation recommendations for each issue, starting with safety zones.

Safety Zones – Current training has succeeded in institutionalizing the safety zone concept, and wildland firefighters generally understand its importance. However, firefighters noted in Phase I that they received little guidance on what constitutes an adequate safety zone and did not know how to estimate the size of the zone required under a variety of fuel and terrain conditions.

Goal 34. Define adequacy of safety zones by terrain type, fuel type, and fuel condition.

Implementation Strategy 1 – Publish a "job aid" (concise notes) on sizing safety zones.

The Forest Service's Northern Forest Fire Laboratory has been conducting research on the sizes of safety zones and has produced some preliminary guidance.[6] The report has been widely disseminated. However, no job aids yet exist to help fireline supervisors and firefighters estimate requirements for safety zones.

The agencies should publish a fireline job aid that will help firefighters and their supervisors recognize, select and prepare survivable safety zones. The job aid should be based on the best available research findings, with additional judgments from experienced firefighters and fire managers. If the information on safety zones given cannot be precise, then at least the best information available should be provided, and the information updated as additional research results become available.

Training on use of this job aid should be incorporated into the Fatality Fire Case Studies course currently under development, the existing "Standards for Survival" course and other

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[6]Bret Butler and Jack D Cohen., "An Analytical Evaluation of Firefighter Safety Zones, in the Proceedings of the 13th Conference on Fire and Meteorology, 1996.

training as appropriate.[7] These training packages should focus first on avoiding entrapment altogether, then on the use of safety zones, and finally on shelter deployment as a last resort.

Transition of Command – Some people find it counter-intuitive that smaller fires may pose greater safety risks than large "project fires." However, fire operations can be very chaotic during initial attack and transition phases. Quite often, fire conditions are at their worst while organization is at its minimum. "Transitions" from one level of incident to another are periods of command change, and can be times of disorder, rapidly shifting tactics and miscommunication.

Expert firefighters interviewed during this study recognize initial and extended attack as potentially the riskiest of fire operation environments. The larger fires have Incident Management Teams with Safety Officers and very experienced commanders. Often only the IC or a small group of people is managing a fire during initial and extended attack, with most resources focused on tactical operations. The transition between levels can be especially dangerous because not only is the fire situation becoming more complex, but the command function changes from "fire fighting" to managing an emergency incident.

Radio communications problems on fire initial and extended attack operations also can contribute significantly to safety problems. As fire operations in the urban-wildland interface and interagency operations have become more common, multiple agencies frequently respond to incidents in their initial stages or as they extend. The responders may include local fire departments, law enforcement officers, emergency medical services, state natural resource agencies, disaster relief agencies and others. The lack of radio system compatibility across agencies frequently hampers communication and unified effort, intensifying the risks.

In some cases when the fire's growing complexity necessitates transition to a larger organization, the transition does not occur in a timely manner. In these situations fireline Incident Management Team can find themselves under-organized and overwhelmed by the increasingly complex fire situation. Initial Attack and Multi-Resource Incident Commanders may fail to recognize the need to transfer command to a more highly qualified IC or to expand their organization until the need is imminent. Some ICs regard turning a fire over to a more experienced commander as a failure or embarrassment. This is deeply rooted in the IC sub-

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[7] The "Fatality Fire Case Studies" course was until recently entitled "Firefighter Survival."

culture. We heard of many experiences where teams took chances with safety in their all-out effort to "catch" a fire before a more experienced team would be required. A concerted effort to catch a fire does not necessarily mean a violation of safety-based firefighting, but experienced firefighters know that this pressure to perform often has resulted in excessive risk-taking in the past.

Another transition flagged as having dangers that may not be obvious is the transition back to a local unit from an Incident Management Team.

Even under the best of circumstances, transferring command responsibility from one group to another represents an inherently complicated task that is hard to do well. For these reasons, firefighters, IC's, Incident Management Teams, and Agency Administrators must recognize transitions as complex situations with enormous safety implications. This led to the following goal:

Goal 35. Assure that safety is adequately considered as transitions are made from initial attack to extended attack, from extended attack to Type II IMT, from Type II to Type I IMT, and back from IMT to local unit.

Implementation Strategy 1 – Emphasize the safety aspects of handling transitions in various command courses.

The agencies should make sure there is adequate emphasis put on the potential dangers at the operational level in making transitions in the S-200 (Initial Attack Incident Commander - ICT4), S-205 (Fire Operations in the Urban Interface), S-300 (Incident Commander, Multiple Resources), S-430 (Operations Section Chief), S-400 (Incident Commander), S-420 (Command and General Staff), and S-520 (Advanced Incident Management) courses. The various dangers of transitions, and possible problems with attitudes related to making transitions need to be pointed out, especially the importance of maintaining good communications during the transition. The transition needs to be recognized as a different kind of event requiring special attention.

Implementation Strategy 2 – Develop checklists for each of four levels of transition.

Provide checklist-style job aids to facilitate command transitions of four types:

- Initial Attack to Extended Attack-Multiple Resources (Type IV to Type III)
- Extended Attack to Escaped Fire (Type III to Type II)

- Type II/Type I Transitions (both directions)
- Transition from an Incident Management Team back to the local unit

These job aids should appear in the Fireline Handbook, with specific checklists for each. They should also include guidance general to all types of transitions, such as:

- Do not hand over fires in the heat of the day.[8]
- No transition will be made without first evaluating and ensuring LCES for the firefighters.
- Transfers of command will be made face-to-face.

Emphasizing Effective Initial and Extended Attack – In the past 20 years, the agencies have been highly effective on most initial attack efforts. While affected by various environmental and weather factors, too, it has been an indication of success that the vast majority of fires are kept under 100 acres. For example, in 1994, only 2 percent of the 70,000 fires required large-scale suppression efforts. In fact, 94 percent of the total acreage burned resulted from two percent of the fires. Fire suppression expenditures follow the same pattern, with one percent of all fires accounting for 62 percent of fire suppression costs.[9]

However, as the agencies continue on a path of downsizing and budget-cutting, the resultant organizational changes have eliminated some critical initial attack and extended attack resources and field level oversight by experienced personnel, diminishing the capacity to safely and effectively attack unwanted fires while they are small. At the same time, the agencies expended record-breaking amounts of money suppressing large fires in 1994 and 1996. Though stated policy says otherwise, the actions suggest a willingness by budget decision-makers to eliminate agency resources needed for fighting many small fires, and chance having to occasionally pay the price when a fire becomes large.

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[8] From a paper by Karl Weick, "Wildfire and Wisdom," University of Michigan, as quoted by Patrick Withen, in a presentation at the "Canada/U.S. Fire Safety Summit, Rossland, B.C., Canada, September 29-October 2, 1997.
[9] USDA Forest Service, Fire and Aviation Management, "Courses to the Future – Positioning Fire and Aviation Management," 1995.

Fire program management is well aware of the economic arguments in favor of expending funds to catch unwanted fires in their earliest stages.[10] The debate on the merits of spending money up-front to keep fires small is driven by budget pressures, and centers around trade-offs between avoiding the monumental costs of large, escaped fires and the risk of overspending on smaller ones. The public and political leaders outside the agencies tend to be more willing to spend money on large catastrophes when they occur than to spend money for prevention or resources to nip problems in the bud. (This has traditionally been a problem for many safety programs in and outside of fire protection.)

However, large unwanted fires are not only expensive, they expose massive numbers of firefighters and support personnel to risk. Many people within the Federal firefighting community have called for a reassessment of policy and procedures regarding fire control priorities. They argue that by focusing on rapid, effective initial attack of unwanted fires (such as the use of the new, small, fast attack air tankers where appropriate), they can significantly reduce fire expenditures and advance the cause of firefighter safety by reducing risk exposure. This approach would represent another fundamental cultural change for the agencies, not unlike those shifts in military doctrine that have come to emphasize superior firepower over manpower. It is interesting to note that both the Canadians and Australians commit far fewer people to individual fires, and both countries have firefighter safety records superior that of U.S. agencies.

Goal 36. Where appropriate, in areas designated for aggressive attack, more fires should have a rapid initial response when they are small, if resources are available (and when the potential for spread and the values to be protected are a concern).

Fires need rapid deployment of appropriate fire suppression or management resources. Some fires may produce resource benefits if managed in a manner that is consistent with fire management and land use management plans. A fast response facilitates size-up and making a decision on what to do for a particular fire.

Implementation Strategy 1 – Get employee buy-in at all levels for use of more vigorous initial and extended attack.

The agencies must establish a comprehensive policy that enables them to simultaneously achieve two organizational missions:

[10] We are not addressing here the fires that are monitored but allowed to burn for desired land management results.

1. Accomplish their targets for use of fire in eco-system management.
2. Maintain their capability to safely and effectively control unwanted fires without the high cost and high risk of massive mobilizations.

These missions have to be met in the face of agency downsizing requirements. The agencies should design and carry out a collaborative process to involve employees at various levels of their organizations and interagency partners in establishing a comprehensive policy to simultaneously complete the two missions outlined above.

Fire Orders, Situations That Shout Watch Out, LCES, and Other Tactical Guidelines – There is general agreement that fire orders are and should be a basic tenet of the culture. There is also agreement that they should be understandable, memorable, direct, and reliable.

Philosophies vary, however, on the value of rules and the role rules play in effective, highly reliable organizations. Attitudes toward the 10 Standard Fire Orders, 18 Situations That Shout Watch Out, LCES, Downhill Line Construction Guidelines, and other "tactical references" are no exception. Some argue that the Fire Orders are *orders*, not to be violated since the lessons on which they are based have come at a high price. Others argue that the agencies should be teaching people to think flexibly rather than follow rules, and that the various tactical references and "rules" are intended to distill past wisdom and to prompt leaders to think about safety, but not to be inflexible hard and fast rules, a philosophy which would represent a fundamental shift in thinking, and is controversial.

In the report on the South Canyon multi-fatality fire, the Firefighting Orders and Watch Outs were described as follows:

> *"The 10 Standard Firefighting Orders and 18 Watch Out Situations were designed to help firefighters recognize and mitigate firefighting risks. They also provide a ready checklist for periodic review as fire action progresses. Every firefighter is instructed in their meaning and application."*[11]

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[11] Report of the South Canyon Fire Accident Investigation Team.

This passage appears to describe a situational awareness and risk assessment tool. However, in the cultural context of the five agencies, departures from these safe practices are viewed as violations of rules not intended to be broken:

> *"The Ten Standard Fire Orders are firm. We don't break them; we don't bend them. All firefighters have the right to a safe assignment." - Bruce Babbitt and Dan Glickman; Secretaries of the Interior and Agriculture*[12]

In fact, the agencies routinely use these references as a yardstick against which performance is measured when tragedy strikes.

Ironically, there is a growing dissociation between the behavior of firefighters and this policy. Thirty to forty percent of the survey respondents in Phase I indicated that fire orders are frequently violated, that lookouts and safety zones are often inadequate and that risky downhill fireline construction was fairly common and encouraged by transporting firefighters to the ridgetops above fires by parachute and helicopter.

Besides the issue of how rigid are the orders, there were many complaints in the interviews and surveys about having far too many tactical guidelines to remember in the field – 54 in total. The guidelines include the 10 Standard Firefighting Orders, 18 Watch Outs, 4 Common Denominators of Tragedy and Near Miss Fires, Downhill/Indirect Line Construction Guidelines, LCES, Urban-Wildland Watch Outs, the Look Up, Look Down, Look Around Indicator Checklist, and others. By one count, the various tactical references include 156 separate pieces of information intended to guide the actions of firefighters on assignment.

According to Miller's Law, the human mind can comprehend just seven (plus or minus two) concepts or inputs while engaged in a task.[13] It is unlikely that the 10 Standard Fire Orders, 18 Watch Outs, and other tactical references provide effective guidance to firefighters, since their overwhelming number precludes their use as concise, memorable and sequential guides.

A related issue was that in the most recent modification of the Watch Outs and fire orders, their language was weakened and unnecessary items were added to the lists.

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[12] Dept. of the Interior, Bureau of Land Management, Standards for Fire Operations.

[13] George A. Miller, 1956, "The Magic Number Seven Plus or Minus Two: Some Limits on Our Capacity to Process Information." Psychological Review 63: 81-97 and J. Cook, "Fire Environment Size-up: Human Limitations versus Superhuman Expectations," Wildfire, December 1995.

Though still controversial, there is a growing recognition for the need to consolidate and change the use of these rules, guidelines and tactical references.[14]

Thus, to positively impact the behavior of firefighters in the field, the agencies must accomplish three things relating to the Fire Orders, Watch Outs and other safety guidelines:

1. Conduct formal content analysis of the entire spectrum of safety guidelines, reducing them to a minimum, essential set.

2. Determine from that essential set which, if any, represent truly hard and fast orders, rules, or maxims *never* to be violated.

3. Foster a culture that expects people to think rather than obey rules and prepares them to function this way. Prepare firefighters with a framework for *applying* (versus just "knowing") fire safety guidelines and influencing the decision making process. Training firefighters to use a common risk management process will provide that framework. "Training people to think rather than obey rules" was one of the highest rated "solutions" in the Phase I survey.

The above considerations led to Goals 37 through 39.

Goal 37. To prevent information overload and allow flexibility, the fire orders should periodically be screened to identify the minimum essential set, and that should be rigorously enforced.

Implementation Strategy 1 – Conduct a content analysis of the various guidelines and produce a reduced set.

The agencies should conduct a formal content analysis of all fireline tactical and safety references (10 Fire Orders, 18 Watch Outs, LCES, Downhill/indirect Line Construction Guidelines, Look Up, Look Down, Look Around Indicator Checklist, Urban-Wildland Watch Outs, etc.). Following this analysis, the agencies should revise their fireline safety references to produce a minimum, essential set. This set of orders and guidelines should be revisited

[14] See Cook, 1995; Braun and Latapie, 1995; Human Factors Workshop, 1995; Putnam, 1995; and Weick, 1995. Full references are in the bibliography submitted as an appendix to the Phase I report.

periodically, in light of information on casualties and near misses, and "stories" about decision-making at fires. The degree to which the guidelines help avert tragedy or lead to confusion or inflexibility should be considered.[15]

Implementation Strategy 2 – Re-define which are truly orders and which are guidelines that can be modified under special circumstances.

As part of the above screening process, the agencies should determine which, if any, elements should be stated as mandatory rules or "orders," and which should be codified in agency policy. One can frame a standing order as "do this unless you have darned good reason not to. Be prepared to defend deviations." That is different from saying "always follow this no matter what." Examples should be given of reasonable exceptions to the rule – and how often such exceptions are likely to occur. In other words, don't encourage exceptions to a rule that will usually keep you out of trouble.

The intent of this strategy is not to establish rules, but to establish the revised set of "orders" as a teaching tool, an effective, tactical job aid, and the basis of a situational awareness and decision-making framework that will help define the new firefighter safety culture.

The above strategies should be implemented in concert with strategies listed under Goals 38 (risk assessment), 39 (training on Watch Outs), 72 (emergency skills), and 77 (shielding supervisors from information overload), and the various discussions on training leadership in decision making.

Goal 38. Fire safety practices should be driven by a systematic risk assessment that gets updated periodically.

Implementation Strategy 1 – Adopt a comprehensive risk management approach to firefighter safety.

The organizational culture of wildland firefighting should flow around a core philosophy of risk management. The Federal Emergency Management Agency (FEMA) defines risk management as "...any activity that involves the evaluation or comparison of risks and the

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[15] Dr. Kurt Braun (University of Idaho - School of Psychology) has completed a "hierarchical cluster analysis" on the fireline safety references as part of small studies examining memorability. Dr. Braun's work was not published at the time of this report but it is planned for publication and was recently presented at an American Psychological Association meeting.

development of approaches that change the probability or the consequences of harmful action." This concept encompasses a process of identifying and evaluating risks, as well as identifying, selecting and implementing control measures to alter risk.[16] A simpler definition calls risk management "a process of evaluating and mitigating hazards in the work environment." Regardless of definition, risk management must be an ongoing and continuously improved process. Likewise, the methodology for risk assessment needs to be periodically revisited and revised.

The agencies should adopt a risk management approach to firefighter safety which de-emphasizes the memorization of rules and emphasizes risk assessment, evaluation, mitigation, and more evaluation – within the firefighter's work situation. The approach should prepare firefighters with a framework for *applying* (versus "knowing") fire safety guidelines and for influencing decision making and the decision making process. The Superintendent of the Boise Interagency Hotshot Crew, Jim Cook, has developed an approach to risk management that is a five-step risk management process that is based on the U.S. Army's operational risk management standards. Though adapted to wildland firefighting it is philosophically consistent with the Army's method and with other five-step risk management approaches, including the one employed by FEMA. Cook's approach appears sound and can be a foundation for a *comprehensive* risk management approach to firefighter safety. This should be a major initiative of the NWCG Safety and Health Working Team, the Training Working Team, and possibly others as appropriate.

Implementation Strategy 2 – Establish and cultivate a culture that encourages people to think, make effective decisions, and place a priority on firefighter safety.

In this culture, the fireline leader would willingly use the essential set of fireline safety references not as a list of inviolate rules, but as mnemonic devices and a means for distilling wisdom and experience. Rather than blindly following rules (or resisting them), fireline leaders would apply the references to support a situational awareness and risk management process.

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[16] Federal Emergency Management Agency – U.S. Fire Administration, Risk Management Practices in the Fire Service. 1996.

Implementation Strategy 3 – Incorporate the risk management concept in training.

The NWCG has incorporated Cook's risk management approach in the recently re-developed S-339 (Division/Group Supervisor) course. Cook's approach will also form the foundation of the Fatality Fire Case Studies course currently under development.

After introducing the concept of risk management at the firefighter level, continue to reinforce and expand its use throughout the curricula. Currently, risk management is well addressed in S-131 (Advanced Firefighter), but a comprehensive approach will require compatibility with what is done elsewhere in the curriculum.

The training needs to clarify the use of the various fire orders and guidelines, and how they relate to risk management.

Goal 39. The list of Watch Outs needs to be integrated into training and decision making, and their role as warnings emphasized.

Implementation Strategy 1 – Clarify the use of the Watch Outs in training.

To a large extent, this goal is already met in existing training. However, there seemed to be a perception among some respondents in Phase I that the Watch Outs have become disconnected from decision-making and the creation of strategy and tactics. Thus feedback needs to be given to the instructors in leadership and tactical classes to ensure they train that the "list" of Watch Outs is more than a list, it is a tool. They should train through role playing on how to use the Watch Outs to assist in maintaining situational awareness and make effective decisions during periods of high stress. The Fire Orders and Watch Outs are "touchstones" that should be the baseline to which a firefighter returns during times of high stress, fatigue, and information overload.

Span of Control – Maintaining an appropriate "span of control" is a widely accepted management and organizational principle. Organizations typically try to optimize supervisory span of control by having minimum and maximum limits for the number of people assigned to each supervisor. This enables an organization to maintain productivity while preventing supervisors from becoming overextended.

Traditionally, organizations, including the military, tend to use a supervisory span of 3-7 persons. Recently, some business organizations, interested in becoming "leaner" and more competitive, have found that they can remain effective with larger spans of 11-15 "direct reports" per supervisor or manager. This trend has infiltrated the working environments of the agencies. Whether the larger span of control is feasible depends on the nature of the work to be accomplished. Maintaining adequate safety oversight demands smaller spans of control. Consequently, using a span of control at 3-7 people per supervisor continues to make sense for fireline operations.

Participants in Phase I of this study specifically raised as a safety issue the frequently too-large span of control for Division/Group Supervisors. Division and Group Supervisors are often expected to provide effective tactical supervision for many resources, often dealing with supervisors of more than five crews, spread over long distances. Study participants reported that Division Supervisors are often overextended. They note that a reluctance to create additional divisions or to sub-divide divisions exacerbates the problem.

The agencies currently employ a policy of assigning Incident Management Teams based on the complexity of the situation. Some people take the number of divisions (or division supervisors) in use as measure of complexity, rightly or wrongly. For example, fires managed by Type II Incident Management Teams generally are expected to have between two and four divisions. A greater number of divisions may send up a "red flag" and trigger a request for a Type I team. Some people believe that this approach contributes to the reluctance to increase the number of divisions (when that would help reduce the span of control), and has produced the unintended result of diminishing the performance of Division Supervisors, and hence putting safety at risk.

Some study participants suggested that the agencies can relieve the span of control issue by recreating the "Sector Boss" position that was used prior to the transition to the ICS, and/or by employing the segment concept (breaking divisions into smaller geographic pieces) as was discussed earlier in this report.

Goal 40. Workable spans of control should not be exceeded at any level of management, especially not by Division and Group Supervisors.

Implementation Strategy 1 – Encourage flexibility in establishing and subdividing divisions when appropriate.

The agencies should encourage or require Incident Management Teams to establish manageable-sized divisions at fires. Amend policies, guidelines, and training to allow Incident Management Teams the freedom to establish the number of divisions necessary to safely and effectively manage a fire under their control. Do not automatically bump up the level of IMT required based only on the number of divisions. The agencies should also encourage the use of segments.

Implementation Strategy 2 – Reaffirm ideal span of control.

The agencies should reaffirm the concept of maintaining an ideal supervisory span of control for fireline operations at 3-7 people per supervisor, with the optimum being about 5.

Night Operations – In some situations, night operations can be safer than day operations, because nightfall often brings higher humidity, reduced winds, cooler temperatures, and lower fire intensity. The Canadians and Australians often prefer fighting fire at night. However, study participants expressed concerns over situations when fire operations extend into the night without crews having adequate terrain familiarity, or when the nighttime weather conditions produce more dangerous or unsuitable fire behavior compared to daytime (e.g., with a passing unseen front), when the dangers of rolling rocks and falling snags is high or when escape routes and safety zones are hard to find due to reduced visibility. Additionally, because of inadequate periods and facilities for firefighter rest in daytime, night operations can contribute significantly to dangerous firefighter fatigue.

The ability to identify when night operations are appropriate should be built into operations planning and training, which leads to the following goal.

Goal 41. Develop and use criteria for determining when night operations would be safe and effective. Acknowledge that, depending on circumstances, night operations are a tool that may enhance safety or may increase risk.

Implementation Strategy 1 – Develop a job aid or set of criteria for deciding when to use night operations, and when not to.

"Night work" is covered by a single paragraph in the Firefighting Safety chapter of the Fireline Handbook (NWCG Handbook 3). The agencies, through the NWCG, should develop night operations decision criteria (in the form of a brief job aid) for inclusion in the Fireline Handbook. The job aid should include criteria for when night operations would be safe and effective. These criteria must acknowledge that, depending on circumstances, night operations are a tool that may enhance safety or may increase risk.

The job aid should assist fire managers to make a go/no go decision for night operations. It should include the availability of adequate rest in the decision criteria. For some terrain and some areas it may be appropriate to shift the local culture either way toward or away from the use of night operations. The ability to identify when night operations are appropriate should be built into training.

A related issue, firefighter fatigue and adequate rest after night operations, is discussed in depth in Chapter 6.

Leadership Experience and Competence

Unfortunately, one cannot be assured that in the present culture all key fire management personnel meet the performance requirements of their position. As discussed in Chapter 3, there has been a loss of leadership experience due to early retirements, career disincentives to remain in fire duty, and a lack of adequate incentives on the positive side. Lateral transfers to accommodate downsizing, Affirmative Action "fast-tracking," and collateral duties are accepted parts of the culture. The findings of the 1995 Human Factors Workshop stated that "Unqualified personnel are making firefighting unsafe. This includes inexperienced EEO, downsizing laterals, and others who have not worked their way up in the fire organization with a combination of training and experience."[17] More specifically:

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[17] USDA Forest Service, F&AM Technology & Development Program, Findings From the Wildland Firefighters Human Factors Workshop, 1995.

Fast Tracking – There is a perception in the workforce that some women, minorities, and others have been advanced too rapidly without adequate preparation, experience, and Red Card credentials. People spontaneously brought up comments about fast-tracking during the one-on-one interviews. This is an issue that people feel very strongly about. There is strong consensus that without adequate training or graduated experience, some of these fast-tracked personnel are contributing to safety problems. Eighty-two percent of those surveyed felt fast-tracking was a problem, with 49 percent strongly agreeing. The really remarkable finding from the survey was that women and minorities expressed reservation about fast-tracking with about the same frequency as did white males: 84 percent of the women and 84 percent of minorities agreed or strongly agreed that there is too much fast-tracking, versus 82 percent of the men. One experienced female Crew Supervisor said she was very concerned about young women being placed into positions they were not prepared for, and that they would make other women look bad through their incompetence.

Most people interviewed went out of their way to say they had no problem with women or minorities being supervisors or serving anywhere in the hierarchy so long as they were not going to hurt the people below them because of inadequate training or experience. The concern on the part of some of the women and minorities interviewed was that they were being set up for failure, not intentionally, but inevitably nevertheless.

Bumping Under RIFs – Similar to the concern about fast-tracking was a concern about transfers into key fire Incident Management Team positions by people in management who had little or no fire experience, when people get bumped from their position under a reduction in force (RIF). Again, there was a concern that their decisions would affect safety. The concerns over lateral transfers did not register quite as strongly as the concerns about fast-tracking, but 69 percent of the firefighters surveyed agreed that lateral transfers under RIFs were a problem, with 39 percent strongly agreeing.

Criteria for Selecting Key Fire Management Staff – Study participants reported that while circumstances vary by agency and time period, the agencies have generally weakened their use of fire experience as a selection criteria for key fire management positions such as Fire Management Officers (FMOs). People interviewed in the course of this study indicate that having fire experience ranges from being a key selection factor, to a weak factor, to not being included at all for various FMO positions. Fifty-four percent of survey respondents found experience lacking among FMOs. This trend has enormous safety implications.

The FMO is a critical position in influencing safety. Firefighters interviewed in this study singled out FMOs and Crew Supervisors as the positions having the most influence on safety. In a time of downsizing, agencies may find themselves short of personnel with the necessary experience. Downsizing also creates pressures to place individuals from another discipline into an open fire management position. These situations allow people with little fire background to be appointed as FMOs.

As in many large organizations, there are also some people who are promoted beyond their level of competence (the Peter principle). Failure to hold people accountable, failure to screen people for suitability for promotion (beyond considering their technical skills), and difficulty in weeding out or demoting poor performers all contribute to there being some poor leaders in fire management ranks.

The agencies can ill-afford to install people into fire management positions who are less than adequately experienced or trained, thereby sacrificing safety to meet human resources targets or other organizational goals. However, we believe that they do not have to make a choice. The agencies can simultaneously assure competency in their fire management programs and meet these goals.

Crew Supervisors – The wildland firefighters interviewed and those surveyed generally felt that the majority of supervisors were very good, and a strong point of Federal wildland firefighting. However, a small but significant fraction of supervisors were felt to be unsuitable for the job, yet were not weeded out in the current organizational culture. There was a strong consensus (87 percent agreement) that a Crew Supervisor (and higher positions) should not only be able to pass tests, but should also be screened for suitability as a leader before promotion, and screened periodically on-the-job. Leadership and decision making under stress should be among the screening factors. Although this opens the selection to a certain amount of subjectivity, it is something that has been a component of local fire department civil service systems in many cities for decades. "Multi-rater Feedback" (or "360 degree assessment") represent a valuable tool for this purpose, and is discussed later in this report.

The above considerations led to the following three goals:

Goal 42. Fire experience and competency should be considered as critical selection factors for fire leadership and fire management positions.

Goal 43. All personnel in a given position must meet the performance requirements of that position.

Goal 44. Fire management officers (FMOs) must be selected from among those with fire backgrounds.

Implementation Strategy 1 – Set and enforce minimum requirements for key leadership positions.

Goals 42, 43, and 44 above and Goals 47 and 48 on Agency Administrator qualifications, to be discussed later, could be addressed through a comprehensive approach to developing minimum qualifications for primary fire management positions, collateral duty positions, and Agency Administrators who make fire management decisions. The Interagency Management Review Team (IMRT) report recommended this approach in 1994. The Federal Fire and Aviation Leadership Council subsequently tasked an interagency ad-hoc team to establish and define competencies for primary fire positions. This team has taken the position that the same competencies will apply equally to collateral duty fire positions, which is appropriate and encouraging. This group also is establishing training requirements, identifying existing decision tools, and identifying the need for additional job aids for Agency Administrators who make fire management decisions.[18] The strategies being developed by this interagency group will go far to address the above goals.[19]

This effort should be fully supported, and implemented as soon as possible. The task group's charge should be expanded, empowering them to recommend not just desired but *required* competencies for Agency Administrators.

The agencies need to establish a strategy for implementing these recommendations across the Federal fire management workforce. The newly defined competencies should be used in hiring, promotion, and transfers to fire management positions. The agencies also need to

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[18] The team is led by Paul Broyles of the National Park Service and includes Buck Latapie (FS), Mike Benscoter (F&WS), Frank Boden (BIA), Roy Johnson (BLM), and others. Steve Haglund of the BIA represents the Fire Directors (FFALC).

[19] Revisions to required and recommended training for Agency Administrator and fire manager positions have been approved by the FFALC and are scheduled for implementation by Summer 1998.

establish accountability mechanisms to assure that the competencies are applied to these decisions.

Implementation Strategy 2 – Require fire experience for the FMO position.

The agencies should require that all FMOs have the experience and background appropriate for their position. Select personnel to fill FMO positions only from a pool of candidates known to meet the appropriate competencies for the position (consistent with Implementation Strategy 1 above).

Implementation Strategy 3 – Review incumbents who do not measure up, and reassign or retrain if appropriate.

Throughout the study we have heard about unqualified personnel occupying key fire management positions with direct impact on safety, including Fire Management Officers. Should agencies find that individual employees incumbent in these types of positions do not have the necessary competencies, they should be reassigned or at least assisted in gaining the competencies at the earliest possible time. Fire Management Officer and other key fire management positions must be filled by people meeting the competencies approved by the Federal Fire and Leadership Council. Of course there may be people who do not have prescribed credentials but have proven themselves as having the necessary competency, and they should be kept in their positions. Undoubtedly there will be challenges to attempts to remove people when requirements are redefined after they have been given a position, but the attempt should be made, especially for the most flagrant cases.

Implementation Strategy 4– Require Fire Management course for FMOs or their equivalent.

The "Fire Program Managers" course is currently required for new FMOs in the FS and for all FMOs in Interior agencies. The agencies should require this course for all management positions dedicated to fire management, including incumbents who have not had it. It is difficult to list, by agency and position, who should be required to attend this training, but the intent should be that all District/unit level FMOs would attend. One training officer suggested that a simple way of thinking about who should attend is "if you have fire management in your title, go to this course."[20]

[20] This requirement was approved by the FFALC in February 1998 and now needs to be implemented.

Implementation Strategy 5 – Give fire management training to all Agency Administrators with fire program responsibilities.

The following courses are available for Agency Administrators:

"Fire Management Leadership," for Forest Supervisors, Park Superintendents, BIA Superintendents, FWS Refuge Managers, BLM Managers, etc.

"Local Fire Management Leadership," for District Rangers, Area Resource Managers, Chief Park Rangers, etc.

"Fire Management for Executives," in development, intended for Deputy Chiefs, Associate Directors, Regional Foresters, State Directors, Regional Directors, Area Directors, etc.

The agencies need to examine the above courses to evaluate their treatment of firefighter safety and revise them as necessary. More importantly, we recommend that they be mandatory.[21]

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Also relevant to implementing the above three goals is Implementation Strategy 3 under Goal 11, the establishment of an apprenticeship program, which ultimately will produce people with better backgrounds for fire management assignments.

Freshness of Experience – Most Red Card certifications remain valid if the holder functions in the certified capacity once within a five-year period. Rusty command skills were thought to be a major problem by 28 percent of those surveyed in Phase I. At least one state (Washington) uses a three-year rather than five-year threshold to keep fire managers certified. Technology and procedures change too much over five years for five years away from command to be a safe period. This led to the following goal:

Goal 45. Those in sensitive command functions should have relatively fresh or updated experience.

[21] This, too, has been approved by the FFALC, in February 1998.

Implementation Strategy 1 – Require more recent experience (or equivalent training exercise).

This was already discussed in Implementation Strategy 4 under Goal 11, which dealt with various ways to increase experience levels.

Crew Supervisor Leadership Competency – The participants in this study generally felt that the majority of Crew Supervisors were very good. More than 90 percent of the survey respondents believe that the concern Crew Supervisors show for their people's safety represents a strength of the Federal firefighting system. On the other hand, when asked to rank the fire management positions most in need of strengthening, 34 percent of the survey respondents indicated that Crew Supervisors were their priority. This could be taken to mean that it is a key position and needs all the help it can get. There was strong consensus among the participants that Crew Supervisor candidates should be screened to determine their suitability as a leader, and given courses in leadership skills. Though screening opens the selection process to a degree of subjectivity, fire departments have successfully screened candidates using suitability criteria for decades.

Goal 46. Crew Supervisors should be selected not only for technical knowledge and experience, but also for their leadership skills, interpersonal communications, and ability to conduct on-the-job training.

Implementation Strategy 1 – Develop a "multi-source assessment" center approach to selecting supervisors.

The terms "Multi-Rater Feedback," "Multi-Source Assessment," or "360-degree Feedback" are used in the human resource development and organizational development fields to describe a concept for obtaining and providing sharply focused feedback on leadership. The concept employs research-based survey instruments to collect information from co-workers, peers, subordinates, superiors, and others to assess an individual's leadership abilities, pinpoint strengths, and identify areas for improvement. The multi-source feedback concept has moved from "emerging technology" to state-of-the-art in the human resource development field.

The agencies should explore the best practices of large organizations that are employing these "360-degree feedback" programs and establish a multi-source assessment program. The agencies would use the 360-degree feedback methods to prepare, select, and evaluate Crew Supervisors. A successful 360-degree feedback program has the potential to improve the

preparation, selection, and evaluation of fireline Incident Management Team across the spectrum of positions.

Implementation Strategy 2 – Stiffen other requirements for Crew Supervisor.

In addition to multi-source assessment, the agencies should implement four practices to stiffen the Crew Supervisor requirements and strengthen the selection process:

- Have Crew Supervisor certifications reviewed by a certification panel. The panel could be comprised of experienced Crew Supervisors and Division Supervisors. The panels could be local (zone), regional, or national, and would screen candidates for appropriate experience, training, leadership ability, interpersonal communication skills and the ability to conduct on-the-job training. Much of this information can be obtained from training and experience records and multi-rater assessment.

- Test (versus just teach) Crew Supervisor candidates about critical elements from the Crew Supervisor Position Task Book prior to final certification.

- Certify new Crew Supervisors only for a probationary period of one season, after which evaluations and 360-degree feedback information will be used to assess performance in the critical areas of technical ability, leadership, interpersonal communication, and the ability to conduct on-the-job training. A decision then would be made on whether to fully certify them.

- Encourage Crew Supervisor candidates to take "detail" or temporary assignments to Hot Shot crews. The National Park Service currently details aspiring Crew Supervisors to three-week assignments with a Hot Shot crew as an opportunity for them to gain experience and to be assessed by an experienced Crew Supervisor. This approach provides an effective model.

These recommendations may be difficult to implement for EFF Crew Supervisors; some additional strategizing is necessary on how to achieve this goal for them.

Implementation Strategy 3– Train supervisors and/or candidates for supervision on how to conduct on-the-job training.

Refer to Implementation Strategy 1 under Goal 14 dealing with training people on how to present OJT, and also the strategies under Goal 71 (on-the-job training).

Other aspects of training supervisors are discussed in the implementation strategies for Goal 69 and Goal 73 (leadership and supervisory skills), and many other goals throughout the report.

Agency Administrators – Many people we interviewed, including several senior firefighting experts, raised the point that the agencies no longer required their Agency Administrators to have any fire background. In contrast to the past, a growing number of Agency Administrators have little, if any, fire management experience. Many people at different organizational levels are concerned that this lack of experience impacts safety when Agency Administrators evaluate fire control strategies, interact with Incident Management Teams, set program priorities, and deal with political pressures at fires.

There exists a strong perception that Agency Administrators and other senior managers lack interest and understanding on critical fire issues and do not go to bat for their fire programs to obtain adequate resources. Consequently, while fire suppression expectations on the part of the public have remained the same or increased, resources have dwindled, directly affecting the ability of the agencies to perform their fire management missions safely and effectively. Fully two-thirds of the survey respondents felt that Agency Administrators and senior staff understood firefighting needs less today than in the past, and that this is impacting safety.

Agency Administrators came under criticism in the interviews and survey for failing to set the proper safety tone in briefings and in dealings with Incident Management Teams. The criticism was of three sorts:

- Meddling in fire management without having adequate fire safety knowledge. We heard of cases where Agency Administrators demanded strategies that did not assure firefighter safety, such as "light on the land" tactics in extreme fire behavior situations.

- Failure to set the proper tone ("the Agency Administrator hid during the fire"). This may be from lack of knowledge or interest, being too busy, or other reasons.

- Inappropriate strategic goal setting, such as having an expectation of containment without understanding that the resources available will not be adequate to do so; or setting politically motivated goals that may increase risk for firefighters.

On the survey, 30 percent of respondents said that Agency Administrators only occasionally or rarely set the proper safety tone; only 23 percent felt they usually set the tone properly. It may also be true that the safety tone set for a fire reflects the Administrator's general safety tone on his or her unit.

Some Agency Administrators were among the harshest critics of their peers. They lamented the fact that Agency Administrators no longer have to have fire experience. About one-third of the Agency Administrators surveyed said that they thought that their fellow Agency Administrators only set the proper tone occasionally or rarely, if ever.

An Agency Administrator does not necessarily have to have experience fighting fire for a season any more than an army general has to have served as a private. However, they must understand their own capabilities, the capabilities of their fire resources, and the tradeoffs between strategy and safety. The above concerns led to the following goals, which are related to Goals 42 and 43:

Goal 47. No one should be allowed to set fire strategy or tactics for a fire or give any operational orders without having adequate fire experience, or training considered reasonably equivalent.

Goal 48. Agency Administrators should have fire background, or strategic fire training [or delegate fire responsibilities to a subordinate with those qualifications]. [22]

Goal 49. The tone and substance of briefings by Agency Administrators should be conducive to and emphasize safety.

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[22]Some agency reviewers of this report felt strongly that the portion of the goal statement in brackets should be deleted. Others felt that it was unrealistic to expect every Agency Administrator to have fire qualifications. Ideally, the long range culture change should allow the exception [in the brackets] to be dropped, but it may be necessary to leave it in for the short run.

Implementation Strategy 1 – Revise the fire-related competency requirements for Agency Administrators.

Courses for Agency Administrators need to address know their roles and responsibilities during fires and how to balance land management goals and criteria against firefighting feasibility and safety. The changes in requirements have been approved, but implementation of the training on a broad scale needs to be pursued. See also the Implementation Strategies 1 and 5 under Goals 42 and 43.

Implementation Strategy 2 – Give examples to Agency Administrators of critical safety problems they can affect in meeting with Incident Management Team.

Agency Administrators need to understand their role in giving direction through briefings and their delegation of authority, and the need to have accurate and realistic alternatives in the WFSA. They need to understand the consequences of failure (e.g., if a chosen strategy fails, will it result in several hundred more acres burning or will it result in entrapment of several crews?).

As part of their formal training (e.g., the course noted under Goals 42 and 43) give Agency Administrators specific examples of good instructions and dialogues. Also, give examples of mixed messages and orders where someone pays lip service to safety but demands results or actions that are not commensurate with the resources available.

For Agency Administrators who do not have a fire background the examples need to be specific; e.g., describe scenarios where too few crews are ordered to build a line, or ordered to build line in unsafe circumstances, or where they were given unreasonable constraints on tactics that adversely impacted firefighter safety.

Implementation Strategy 3 – Develop refreshers or quick-help approaches for Agency Administrators.

In addition to five-day courses held at Marana, Arizona, Agency Administrators need to be able to get help quickly. Provide one-day fire management refreshers such as is used by the Oregon/Washington region of the Forest Service. Or, call in a "coach" when an Agency Administrator has a fire and does not feel confident. Or, provide "shadow assignments" where an Agency Administrator can learn or relearn how to deal with issues in fire management by observing another agency administrator or a fire manager.

Implementation Strategy 4 – Develop an attitude and ethic of professionalism that encourages retention and promotes safety behaviors.

In the months or even years in advance of any incident Agency Administrators can create a strong safety culture through a variety of tactical actions with respect to daily health and safety. When an incident occurs, it is then a small step up (as opposed to a giant leap) and the entire unit is on board with the principle of "safety first," because it has been an ongoing part of their culture. If Agency Administrators themselves demonstrate this behavior and spend time on this routinely, they will not have to "jump-start" it when an incident occurs. Goals 58 and 59, on professionalism, and Goal 82, on day-to-day safety, develop these ideas further.

Goal 50. Incident Commanders at all levels must be selected on the basis of leadership ability as well as technical competence.

Implementation Strategy 1 – Develop criteria for Incident Commanders, especially for Types 3-5.

The need to improve criteria for selecting Incident Commanders was thought to be of sufficient importance by our team and its advisory committee to merit adding this goal, which was not included in the Phase II report. It was felt that leadership ability often was considered in selecting Type 1 and 2 ICs, but much less so for Types 3 to 5. Even though Type 4 and 5 command relatively small operations, leadership of small units is important for safety, too. Red Card committees must screen candidates for leadership and decision-making ability. Further, ICs (and above) should be screened for criminal background and on psychological criteria such as used to select law enforcement officers; they are in positions of high responsibility for public safety. Legal opinion needs to be sought on defensible job-related screening criteria.

Safety Officers

Overall, 70 percent of survey respondents believed that the use of the Safety Officer position is a strength of the system, and only 5 percent felt that the Safety Officer position needed strengthening. However, some said that the present firefighting culture belittles Safety Officers because of the occasional trivialization of their role in practice: some safety officers give too much emphasis to minor hygiene issues, and not enough to safety from the fire, it was felt.

We believe that the Safety Officer position is important and can positively impact safety on the fireline. However, though the position has been in existence for a long time, the Safety Officer's role has been slow to develop its full strength and potential. The Safety Officer Position Task Book (PTB) generally seems up to par, but the Safety Officer training course is not, and is not approved by the NWCG. With the current focus on safety, the timing is right to strengthen the Safety Officer role.

Goal 51. The Safety Officer position responsibilities, priorities, and independence should be more clearly defined.

Implementation Strategy 1 – Reexamine and clarify the role and organizational placement of Safety Officers.

The agencies should re-examine the Safety Officer role and its placement under the Incident Command System. Under ICS, the Safety Officer works directly for the Incident Commander (IC) as part of his or her Command Staff. Fundamental differences of opinion exist within the agencies as to whether this arrangement is best. Some say that having the Safety Officer on the Command Staff develops an important level of trust and gives the Safety Officer more direct access to the IC and more influence on the IC's decisions. Others argue that the Safety Officer should come from outside the Incident Management Team to provide a more objective perspective, although this displays a lack of organizational trust and sets up a potential adversarial relationship between "safety inspectors" and the Incident Management Team.

A related question is the ability of Safety Officers to adequately detect and correct safety problems on the fireline where risk exposure is greatest – or whether they should even try to do so. The most effective, highest leverage way to influence safety is by not selecting a tactical option that is likely to put people in harm's way. The Safety Officer's input to command decisions is critical. However, most Safety Officers find it difficult to simultaneously discharge their Command Staff duties and also observe and influence safety on the fireline.

We recommend that the appropriate strategy is to build on the strengths of the current system, maintaining the Safety Officer position as a key member of the Command Staff but supplementing them with field Safety Officers ordered to the fire as single resources. Ideally, a field Safety Officer would be assigned to each division or group on a major fire. The field Safety Officer should be tactically savvy and trained to assist crews, Strike Team/Task Force Leaders, and Division/Group Supervisors to assess risk and implement risk controls.

Safety Officers should focus first on firefighting safety, and secondly on other safety and health issues (e.g. hygiene.) They should also be alert to symptoms of extreme fatigue and dehydration, and should interrogate a crew or division supervisor if there is any suspicion of a problem.

Safety Officers themselves must set a good example by being properly outfitted and by obeying safety rules.

A final key point: the use of Safety Officers must not diminish the responsibility of all firefighters and incident management teams for safety (as was discussed under Goal 8).

Implementation Strategy 2 – Set higher standards for Safety Officers.

After being sure what the role of the Safety Officer should be, the agencies, through the NWCG, should form a task group from the Training, Incident Operations Standards, and the Safety and Health Working Teams to review the Position Task Book, training materials, and training and experience requirements for the Safety Officer position, revising them as needed. The result of this task group's work should be to establish training and certification requirements for Safety Officers that give more emphasis to firefighter safety.

At a minimum, the resulting program should:

- Establish a corps of Safety Officers who are physically able (moderate fitness level) and willing to work on the fireline, where they can directly observe and influence the safety of firefighters and fireline Incident Management Team.
- Require a rigorous training and experience regimen that includes prerequisite training and performance in key command and operations positions such as IC Type 4 and Division/Group Supervisor.
- Require successful completion of a Safety Officer course that has been thoroughly evaluated and approved by the NWCG.

To be most effective, Safety Officers must not be looked down upon in the culture as people who have been put out to pasture. The higher standards and reinforced focus of Safety Officers on fireline safety should help restore the status of the Safety Officer position.

Goal 52. For extended attack (and larger) fires, someone needs to monitor operations to ensure compliance with established safety requirements, procedures, policies, and standards.

Implementation Strategy 1– Re-enforce the concept that everyone is responsible for monitoring safety.

Some people suggested that trained Safety Officers should be automatically assigned to extended attack incidents. We believe that the first principle should be to strengthen the safety awareness of everyone in their organizations, not reflexively depend on Safety Officers. This approach will ultimately have more impact and lasting change on the culture than relying on Safety Officers to "inspect in" safety. By carrying out the goals and strategies outlined in this report, the agencies should find little need to formally assign trained safety Officers to the smaller fires.

Implementation Strategy 2 – Assign someone ad hoc to monitor safety during transitions when no Safety Officer is present.

As mentioned earlier, expert firefighters interviewed during this study recognize initial and extended attack as the riskiest of fire operation environments. Many firefighters we surveyed share a strong perception that they face greater risk while fighting small fires that are growing and transitioning to larger operations than they do on large fires that are continuing to grow. The transition can be especially dangerous because not only is the fire situation becoming more complex, but the command function changes from "fire fighting" to managing an emergency situation.

The agencies should require Initial Attack and Extended Attack Incident Commanders to designate a very experienced (perhaps the most experienced) person on their fire as an ad hoc Safety Officer to monitor safety during transition periods. (We do not think that a trained Safety Officer is needed, and the officer would likely arrive too late to observe the transition in many cases.) This strategy should be implemented in concert with the implementation strategies for Goal 35, which dealt with safety during transitions.

Appropriate Use of Various Crew Types

In Phase I we discovered a great deal of concern at all organizational levels over the appropriate use of Type II crews, including contractors, the military, inmate crews, and Emergency Firefighters (EFFs). Of even more concern was the inappropriate use of local

volunteer and career fire departments that do not have adequate training or equipment for wildland firefighting.

Because they often are not aware of a resource's capability (or lack of capability), Incident Commanders and other fireline management sometimes assign crews and other resources inappropriately. This lack of awareness often results because the person assigning the resource is not given information about crew capability and fails to ask about it, or the supervisor is not forthcoming about the unit's experience, capability, fatigue level, or other characteristics.

The general principle must be that Incident Commanders and others making resource deployment decisions understand the capability of crews and other resources at their disposal in terms of competency and condition, and give them appropriate assignments.

Resource Typing – The current resource typing system is helpful, but is based on administrative considerations and not capability. It does not give enough information to facilitate effective deployment decisions. Fire managers we interviewed pointed out the wide range of competency within the Type II crew classification. A Type II crew may be 20 agency employees with extensive fireline experience, equivalent to a Type I crew, or 20 EFFs, hired through an employment service, given minimal training, having no fire experience, and qualified for not much more than mop-up assignments.

While Type I crews also have a range of capabilities, it tends to be narrower because they consist of people with at least a year of fire experience, and they work and train together. The typing system provided for three tiers of crew designation prior to the institution of the ICS in the 1980s, and many managers have commented that they found that system to be more useful.

To make assessing capability even more complex, Type II crews often do not remain as cohesive units throughout a season. Their make-up, and hence their experience and competency, can vary from dispatch to dispatch. In addition, fatigue, particularly the cumulative fatigue of long assignments, multiple assignments or an active fire season, can radically alter the capability of any crew, regardless of type.

To positively impact safety, resource classifications must be useful to those making tactical assignments based on the complexity and physical challenge of the assignments. A useful classification system ideally would provide information about training, experience, physical conditioning, and recent work history (in terms of hours worked, weeks worked, travel time, mode of transportation to the site, level of fatigue, morale, and perhaps even other factors

such as cohesiveness). Incident Management Team members routinely try to determine this information before making assignments, but the current system does not efficiently provide the information.

When war gaming, the military often uses a rating of a unit's "morale" or "capability" that reflects its recent success in combat, fatigue level, supply level, casualties, original training and equipment, and its leadership.[23] Something similar might be considered for rating a fire crew, perhaps providing a point system reflecting the crew's training, physical fitness and equipment, and how that changes over a season. This rating would determine a sub-type within the overall type, especially for Type II crews. Even if approximately right, it would help in making assignments.

Goal 53. A method is needed to rate the capability (competency and condition) of a crew.

Implementation Strategy 1– Use a crew classification system of three or more levels.

The agencies (through the auspices of the NWCG) should return to a resource typing system that allows for at least three crew classifications. The criteria for those classifications would be based primarily on crew organization, training, and equipment.[24] The criteria must be well known and consistently applied.

Implementation Strategy 2 – Consider sub-types within a type of crew, especially for Type II crews.

The agencies should consider establishing "sub-typings" or ratings within a crew type to reflect the capability and fatigue level of a crew. This method would enable Incident Management Teams and ICs to make informed deployment decisions based on the crew's make-up (experience), the experience of the crew leadership and the physical condition/fatigue of the members. A crew's sub-type might well change over the season, as different people are dispatched and as its fatigue level changes.

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[23] Computer simulations of military units almost always include similar factors – even those sold as games today.

[24] Some feel that the criteria should include physical fitness, which can translate into how much work a crew can be assigned if it is in first-rate shape versus just passing minimum standards. However, there legally cannot be different physical standards for different types of crews. Whether their condition can be described if they themselves choose to meet a higher standard (e.g., a Hotshot crew) seems to be an arguable point.

For example, Ronan 10 might be dispatched as a Type II-a crew, with 20 fresh firefighters all with two or more seasons of experience and an experienced Crew Supervisor on his 25th assignment. Later that year, the same Crew Supervisor might take out Ronan 25 as a Type II-c crew, with two squad bosses who have moved up from the ranks during the season, and 5 new firefighters who have just completed training. In addition, they've been out for 10 days and several crew members are sick.

Criteria for establishing sub-typing (a, b, c) might be based on an additive points system, or a system that uses a multiplier that can be greater or less than one for each attribute, and would be applied to the base rating of the crew (Type I, II, or III). For example, a crew out one week would be 1.0, at two weeks .9, and at three weeks .75 times its base rating.

Another alternative is to rate a crew's health and fatigue level separately from its training and experience level.

The crew leader would calculate and provide the crew's score or sub-typing when checking-in. An alternative would be for the Crew Supervisor to fill out a short "form" on a computer or computer-readable media, and have the computer compute the team's rating. Either way, the score would be recorded for the benefit of the Incident Management Team. A high-end Type II crew might be used for assignments like a Type I crew or to work with Type I crews. A low end Type II crew might only be used for mop up or for less taxing assignments.

Implementation Strategy 3 – Consider developing a smart "resource status card" for fast check-ins.

The agencies should consider using a "resource status card" to facilitate the check-in process and provide information to improve resource assignment decisions by the Incident Management Team. This strategy should be implemented in concert with Implementation Strategy 3 of Goal 18 (developing smart Red Cards), and utilize the same "smart card" approach to supporting a computer-based resource tracking function. Like Red Cards, "resource cards" would still need to include visually readable information and a manual resource tracking function to enable ICs and Incident Management Teams to review credentials and track resources at remote fires without electric power, on the fireline, or during equipment failures.

An effective resource card might contain the following (which would easily fit on a 64K computer chip smart card):

Name of Resource:_____ Type of Resource:_____
Home Unit:_____ Home Supervisor Phone:_____
Name of Superintendent:_____ Qualifications:_____
Name of Foreman or Crew Supervisor:_____ Qualifications:_____
Crew Size:_____
Number of Saws:_____
Unique Skills or Equipment:_____
Type of transportation:_____
Number of Radios:_____ Field Programmable?_____
Crew Net Radio Frequency:_____
Number of Days Out:_____ As Of (Today's Date):_____
Fatigue Level:_____(rested, worked, fatigued, long travel)
Health Level:_____(excellent, good, fair, poor)

Goal 54. The condition and competency of crews needs to be considered when making assignments.

Implementation Strategy 1 – Require those who make crew assignments to consider the status as well as type of each crew (and other resources).

It would be easier to take the crew's competency and condition into account if there was a satisfactory method for rating the crews as discussed in the previous goal. However, whether or not a revised rating system is developed, incident managers must consider the condition and quality of a crew or other resources when making tactical assignments. Unlike a military situation, where leadership sometimes must use a less than acceptable unit to do a job, civilian firefighting may have to occasionally not get the job done rather than put a crew in over their head.

Goal 55. Crew Supervisors must accurately report the status and competency of their crews.

Goal 56. The equipment of crews should be reviewed and taken into consideration when giving them assignments.

Implementation Strategy 1 – Require Crew Supervisors to accurately describe the status of their crew at check-in. (The same applies to other resources.)

No one knows the capability, condition, and morale of a unit better than the unit's supervisor. Good information from the supervisor is critical in making informed decisions about their assignment. The current check in the system does not require mentioning of a unit's condition. We think it should be part of a supervisor's duty to describe the status of the unit upon check-in. The same applies for a single resource (for oneself). Dishonesty in reporting status should be considered a serious offense. If any injuries occur on a unit that was inappropriately assigned, the supervisor and person making the assignment should be reviewed and action taken if necessary.

Implementation Strategy 2 – Require Crew Supervisors to describe any equipment problems at check-in. (The same applies to other resources.)

The basic idea is the same as in Strategy 1. Of particular importance is to describe the number of radios and any deficiencies in radios or protective equipment (e.g. missing batteries, radios, shelters, hardhats and gloves or non-standard protective clothing).

Further Improve Intergovernmental Cooperation

Nationally, all three levels of government (Federal, state, and local) are taking responsibility for wildland fires. The growing threat of catastrophic fire in the urban/wildland interface adds to the need for interagency cooperation, and the Federal agencies are interacting with and relying on the firefighting forces of state and local government like never before.

The National Wildfire Coordinating Group (NWCG) has very successfully integrated state and Federal efforts at the national level. The NWCG endeavors to design and coordinate programs of the participating agencies to avoid wasteful duplication and provide a means of

constructively working together.[25] The current membership of NWCG includes two representatives from the Forest Service, one each from the Fish and Wildlife Service, National Park Service, the Bureau of Indian Affairs, and the Bureau of Land Management; two state representatives, one representing Eastern states and the other Western states (through the National Association of State Foresters); and a representative of the U.S. Fire Administration.

The National Fire Protection Association participates as an Associate Member without voting privileges. The Executive Secretary of NWCG is an employee of NASF, and is not a voting member of NWCG.

The NWCG's importance in integrating agency fire management efforts is apparent by the number of references to the NWCG and its working teams in this report. However, despite many successes at the national level, interagency coordination efforts produce variable results at the state and local level. Most Federal, state and local agencies work together well. However, in some cases, cooperation and communication is poor, exposing firefighters to potential safety problems though uncoordinated effort and separate approaches to safe practices.

As they downsize, Federal agencies often are reducing their local presence and fire management and suppression capabilities. Consequently, they are more dependent on assistance from state and local government cooperators. However, many state agencies are going through budget crises of their own and reducing their capabilities. Increasingly, state cooperators view their partnerships with Federal agencies as being unequal arrangements in which the state agencies carry too much of the load. Ironically, state agencies in turn, are relying more and more on local governments for assistance. Wildland fire, and especially the urban/wildland interface, is a rapidly growing local government concern in many areas.[26]

Unfortunately, local fire departments face constraints of their own. For example, most rural communities depend on volunteer firefighters. The number of volunteers has been decreasing nationally and some would characterize firefighter recruitment and retention as a national crisis for volunteer fire departments.[27] In addition, local governments have certainly not escaped budget pressures, downsizing and consolidation.

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[25] NWCG, Wildland/Urban Interface Fire Protection Program, Developing a Cooperative Approach to Wildfire Protection, 1997.

[26] For a detailed discussion of this issue in one state, see Fire Program Review, State of Washington Department of Natural Resources, by TriData Corporation, 1997.

[27] See Volunteer Recruiting and Retention, Issues and Solutions, Final Report, National Volunteer Fire Council and U.S. Fire Administration, 1998.

Consequently, as all levels of government reduce firefighting resources, or do not increase resources to meet demand, resources are short, not only for coordinated and safe initial and extended attack, but to support adequate local, regional and national mobilization.

To maintain or improve safety in the face of this issue, the agencies will need to enter a new era of interagency cooperation. This will require fundamental cultural change that embraces interagency relationships at all levels of government and instills safety consciousness in all interagency efforts.

Goal 57. Further improve Federal-state-local interagency coordination.

Implementation Strategy 1 – Expand official or ex-officio representation of local fire agencies on the NWCG.

Currently, local governments are represented in Federal wildland fire policy decisions through their state representatives, NFPA, and the USFA representative on the NWCG Board. As Federal agencies downsize, they are relying more on the states. As states downsize, they are relying more on local government, and local government has no direct representation on the NWCG.

The NWCG receives policy input in the form of various agencies positions at the national level. The NWCG representatives reconcile the agency positions, resolve differences and recommend policy and standards policy through consensus at a national, interagency level. However, these policy decisions must be implemented regionally and locally and at the operational level of member agencies.

Effective interagency cooperation at the national level sometimes has little effect in the field, where policy must become action locally to produce the desired effect. The same is true of decisions made by Geographic Area Coordinating Groups (GACGs), who often find their initiatives thwarted by the people expected to implement them. It would be useful (and reduce resistance) to involve local and regional personnel in policy decisions from the outset. There is already an attempt to do this in the GACGs, in some more than others.

The NWCG should make sure that representatives of local governments are consulted on issues pertinent to them. The NWCG should consider adding representatives from some or all of

the following organizations to get further representatives of the views of different types of localities, and of state and defensive agencies:

- **International Association of Fire Chiefs (IAFC)**

The IAFC mission is "To provide leadership to career and volunteer chiefs, chief fire officers and managers of Emergency Services Organizations throughout the international community through vision, information, education, services and representation to enhance their professionalism and capabilities." The IAFC monitors Federal legislation and regulations that affect the fire and emergency medical services, provides information, increases awareness, and enhances understanding of government laws and regulations; represents members' interests in congress; serves as liaison with other fire service organizations to form political coalitions on fire service issues.[28]

- **National Association of Counties (NACo)**

According to NACo, it is the only national organization that represents county governments. They provide legislative, research, technical and public affairs assistance to its members. The association acts as a liaison with other levels of government, works to improve public understanding of counties, serves as a national advocate for counties, and provides them with resources to help them find innovative methods to meet the challenges they face.[29]

- **National Volunteer Fire Council (NVFC)**

The NVFC mission is to "represent the volunteer fire and emergency medical services in national legislative, regulatory and standards making matters; provide a national voice for the volunteer fire and EMS service; promote the welfare of the volunteer fire and EMS service."

The NVFC's stated purpose is to "...formulate and promulgate programs useful to the fire/emergency services of the United States; to represent the interests of the member state fire/emergency organizations in the Congress of the United States and with various Federal agencies involved with the preservation of life and property; and to do all other things designed to better preserve the lives and property of the citizens of the United States ..."

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[28] From the IAFC Internet Homepage.
[29] From the NACo Internet Homepage.

The NVFC considers itself the volunteer fire service's representative in the national policy arena, and on numerous national and international committees and organizations.[30] Since much concern about volunteer safety was raised in this study, they are of special interest.

- **National Association of State Fire Marshals (NASFM)**

The NASFM's mission is "...to foster, promote, and develop ways and means of protecting life and property through the exchange and interchange of fire protection and life safety concepts at a state and national level. They consider it their purpose to act for the mutual benefit of state officials engaged primarily in fire prevention and safety from fire. In addition, NASFM's purpose is to promote fire protection programs and activities among the various states, the Federal government, the fire service, codes and standards bodies, private groups and other organizations. NASFM accomplishes this by discussing, developing, sponsoring, and promoting legislation, programs, publications, and activities that will enhance fire prevention and safety from fire.[31]

The NASFM is currently addressing issues that have cascaded from the urban/wildand interface issue, including codes and other aspects of prevention, data, and mobilization related topics. The degree to which the State Fire Marshals affect wildland fire policy or operation varies dramatically from state to state. Current NWCG representatives are well aware of state fire programs, but need to assure there is tie-in to NASFM's efforts either at the level of state representatives to NWCG, or through NASFM directly.

- **Department of Defense**

They are a major land management agency with extensive wildland fires, and also provide crews and other resources to Federal wildland firefighters, both on and off military bases.

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[30] From the NVFC Internet Homepage.
[31] From the NASFM Internet Homepage.

Implementation Strategy 2 – Further develop coordination with "GACGs."

Nine Geographic Area Coordinating Groups (GACGs) provide the foundation of interagency efforts at the regional (multi-state) level. Each GACG has a charter with a core of elements shared in common with other GACGs and some unique elements for their own circumstances. For example, the Northern Rockies Coordinating Group (NRCG) mission statement is "To further interagency cooperation, communications, and coordination, and to provide interagency fire management direction to the Northern Rockies." The NRCG considers its functions to include:

- Operating at a strategic/oversight level
- Encouraging cooperation across jurisdictional and administrative boundaries
- Encouraging and fostering interagency fire business management practices
- Overseeing fire health and safety issues
- Providing interagency direction to field units
- Coordinating agency direction with other members
- Providing a group response to agency specific requests with interagency implications

From this example, the link between the GACGs and the NWCG is clear. However, the GACGs are independent groups, chartered by their local agencies and the local administrative units of Federal agencies. The NWCG implements its direction back through individual agencies or by voluntary cooperation of the GACGs. The NWCG and the GACGs are working to strengthen their relationship, particularly in the area of policy formulation. They are also working toward a common purpose, and have recently agreed to the minimum, common components of a GACG charter.

The agencies should further unify the purposes of the NWCG and GACGs and implement NWCG policy and decisions through the interagency groups established in each region. The GACGs, in our opinion, should be the regional level of the NWCG. This unification should be part of a comprehensive strategy to reorganize and vitalize interagency cooperation from the national policy level to the individual firefighter level.

Some GACGs have further organized their geographic areas into geographic "zones" to work on specific tasks and issues. They help provide local mobilization and dispatch on an interagency basis – part of a three-tier dispatch system called for in the Incident Management Review Team (IMRT) report. Decisions are made and information flows through the geographic

zone rather than through individual agencies on issues with interagency ramifications. We believe that this concept provides a key element of a comprehensive strategy to reorganize national interagency cooperation.

Currently, the NWCG and representatives of the GACGs meet, at most, annually. GACG representatives are not required to attend NWCG meetings, nor are NWCG representatives expected to attend GACG meetings. Regardless of the ultimate NWCG/GACG relationship and structure, the NWCG and GACG representatives should meet together at least semi-annually. Attendance should be mandatory and subsidized to ensure that both NWCG and GACG leadership is not limited only to certain agencies.[32] We believe that this course of action represents a fundamental change, one that is important to make, and an element of a comprehensive strategy to reorganize national interagency cooperation.

Implementation Strategy 3 – Ultimately develop a nested set of interagency organizations.

In the long range, a comprehensive strategic plan should be developed to reorganize national interagency cooperation from the national policy level to the field unit level. An effective strategic vision might include:

- The NWCG representing a single, national body to further interagency cooperation, communications and coordination, and provide interagency wildland and urban/wildland interface fire management direction for the United States.
- Geographic Area Zone Coordinating Groups (GACGs) that
  - Participate in NWCG policy making efforts and decision-making
  - Establish cooperation across boundaries
  - Provide interagency direction for field units and perform oversight
  - Coordinate interagency direction for field units.
- Zone organizations forming the essential building block of interagency coordination and:
  - Participating in NWCG policy formation and decision-making
  - Determining training and operational needs at the local level

[32] There are divergent views on how good the current attendance is. All GACGs should be represented at each meeting.

- Implementing NWCG policies and decisions
- Coordinating their efforts among interagency partners
- Maintaining strong working relationships between the units of local, state, and Federal agencies

The trend has been toward developing such a tiered system. We encourage further progress be made in that direction.

Summary

This chapter on leadership discussed fire management policy, appropriate use of various types of crews, strategy and tactics issues, leadership, experience, and competence, use of Safety Officers, intergovernmental coordination. These leadership issues also affect the organizational culture issues discussed in the preceding chapter and the human factors issues discussed in the next chapter.

CHAPTER 5. HUMAN AND PSYCHOLOGICAL FACTORS (INCLUDING TRAINING)

This chapter primarily addresses aspects of safety that deal with the human mind and cognition – its capability to deal with changes, pressure, information overload, relationships with others, rewards, denial – a wide range of psychological factors that affect safety. It also addresses training. The focus in this chapter is more on the firefighting or Crew Supervisor level that the senior levels of leadership, except for the discussion on leadership training.

Self-Image and Self-Assurance

Getting and maintaining an appropriate level of confidence and self-image among firefighters is a crucial aspect of safety that is heavily influenced by the culture.

Awareness and Confidence – Many new firefighters are unaware of some of the dangers associated with fighting wildland fires, such as falling snags. At the other extreme, many experienced firefighters become somewhat complacent or over-confident in their ability to survive most situations. Some firefighters practice denial of fireline dangers so they can "cope" with the situation.

We can use two scales to describe how firefighters perceive the dangers they face. The first scale describes an individual firefighter's confidence, and ranges from fear of the fire and a lack of confidence at one end, to over-confidence or arrogance at the other. We might describe the midpoint as self-confident, with a healthy respect for the fire, or what Weick (1996)[1] calls "an attitude of wisdom."

The second scale describes the firefighter's awareness of the dangers associated with the fire. This scale ranges from lack of awareness of the risks, most likely from lack of experience, to denial of the risks in the face of the evidence at hand. We describe the desirable midpoint as an accurate awareness and appreciation of risks.

The agencies face a significant challenge in teaching new firefighters about the dangers of wildland firefighting without scaring them off from fighting fires aggressively. On the other

hand, not stressing the risks increases the likelihood of complacency in the face of danger, which makes continual risk assessment such an important attribute to promote.

Psychological Preparation – Firefighters, especially those in supervisory and Incident Management Team positions, often have problems with stress, fatigue, and mental overload. There is little training or advice given on how to mentally prepare oneself for what is ahead, how to avoid the impacts of fatigue, or how to mentally "reload" during stress. Ways to mentally refresh have generally not been considered part of training, even for supervisors and senior managers.[2]

There were comments in the interviews and survey in Phase I that everyone from firefighters on up needed to be taught how to deal with large amounts of information in the field - and how to recognize when critical pieces of information are missing, especially under stress.

Extended stays away from home also cause some of the stress that firefighters experience, especially about the third week away. (This was considered one of the reasons for the higher injury rate observed the third week out, in a BIA study.[3])

The Right Stuff – Considering that everyone surveyed in Phase I was connected with wildland firefighting and about half were seasonal employees, it was surprising to find that almost three-quarters of the group (73 percent) agreed either "somewhat" or agreed "strongly" that many firefighters were wrong for the job. Many people interviewed also felt that many firefighters, Incident Management Team members and decision-makers may be wrong for their jobs, too.

The feelings about selecting leaders were especially strong. Many people interviewed thought that the agencies need to subjectively evaluate individuals' competence to lead, and assess their likely performance in an emergency before promotion, and periodically after promotion. A question on the survey asked specifically whether screening is needed to select first-level supervisors. A striking 87 percent of those surveyed agreed with this notion, with 45 percent strongly agreeing - a very strong opinion on this survey relative to other questions.

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[1] Karl Weick, "The Collapse of Decision-making in Organizations: The Mann Gulch Disaster" *Wildfire,* 5(3), 1996.

[2] Putnam has keyed on this problem and recommended use of various techniques including meditation in the field. Presentation at Northwest Wildfire Conference, 1996.

[3] Personal communication, Steve Haglund, Fire Program Director, BIA, 1996.

Psychological Balance – A healthy psychological balance and self-image is obviously a desirable goal. But what does it take for a firefighter to avoid feeling "pushed" by the machismo component of the job? What does it take for a firefighter to be realistic about the risks, challenges, and difficulties, and not feel like they have to say "I can do anything." How do we focus the "can do" attitude and make it a strength? How do we focus the natural competitiveness of firefighters? This and the issues above are addressed by the implementation strategies of the next several goals.

Goal 58. Firefighters need to maintain an appropriate psychological balance, avoiding the extremes of paralyzing fear of the danger, unawareness of the danger, or overconfidence/ complacency/denial.

Implementation Strategy 1 – Promote the image of a well-balanced professional firefighter as a role model.

The agencies should promote an attitude of safety and prudent risk taking, and should foster an image of what a professional competent firefighter is. The image should be shared across agency, cultural, and sub-cultural lines. The desired safety culture would have the following values with respect to firefighters and risk taking:

- Firefighting must be viewed, both by the agencies and by firefighters, as a profession requiring skill as well as guts, where unnecessary or unwise risk taking is considered unprofessional. Safety is to be promoted as following from skills that professionals use, such as proper use of protective equipment and proper assessment of risks (professionalism is discussed further in Goal 59 below).

- Firefighters are people who like excitement and have enough courage to "face a wall of flame" and stay functional, despite their natural fear and the real danger.[4]

- The "can-do" attitude of firefighters, especially in elite units, would be accepted as a strength, but the focus of the can-do spirit would be shifted from "can-do regardless…" to "can do but not if it means taking unwanted risks."

[4] "Anchor and flank" is a much preferred tactic to frontal assault, but the bravery is still there.

- Pride would be felt for good performance only after taking into account risk assessment and control. The Federal firefighters of the future should be proud that they made a smart assessment of their situation and that their assessment drove decisions along the way to success.

- The organizations and the culture they operate within should not promote safety by slogans or telling people to "work safe," but rather, as said above, by promoting the skills that lead to safety as being a professional approach. Slogans are viewed as lip service and reduce confidence in leadership. Urban firefighters have had a major culture change in the past two decades of the kind that is desired for wildland firefighters. What was once a macho culture of "smoke eaters" now considers it foolish and unprofessional to fight an interior fire without wearing breathing apparatus and full protective outfits.

- The firefighters that people look up to and emulate will be more than well trained, fit, and experienced. They will exercise skills without being bullied, pushed, intimidated, or "dared" into doing more than is reasonable, realistic, and safe. They will be known for "doing it smart."

To promote the above images and attitudes, and thereby help change the culture, the following steps are recommended:

- Promote the concept of "professional skills" rather than safety per se in a variety of ways, such as in training, through articles and stories in newsletters and magazines, and through word of mouth from experienced firefighters.

- Spread "stories" that illustrate skill and risk assessment rather than guts. Tell stories about real incidents to help people picture the inconceivable. To reduce complacency, illustrate how happenstance and the confluence of hard-to-imagine events led to major disasters in 1933, 1937, 1949, 1953, 1966, 1990, and 1994. Have these "stories" passed from one generation to another.

- Recognize that Hotshots, Smokejumpers, and other "elite" professional firefighters serve as role models and focus first on implementing important cultural changes through them. Get them to buy in, such as through participation in discussions of how to get Type II crews and others to emulate their good practices.

- Recognize that the "elite" firefighters feel pressured to succeed, and work with that motivation. Currently, there is more pressure on firefighters to put the fire out than to do it safely. Change that focus by promoting professionalism, risk assessment, and risk control as key components of group success.

- Encourage realistic training (to build confidence).

- Encourage situational awareness (to reduce lack of awareness of dangers).

- Disseminate the good overall statistics on safety (to reduce unwanted fears) but also disseminate data and examples on the near misses and injuries (to maintain awareness).

- Reward ideas that contribute to safety, without denigrating courage.

This strategy should be implemented in concert with the strategies listed for Goal 59 (professional image), Goal 38 (risk management), and Goal 2 (right to speak up on safety).

Professionalism/Professional Image

A common lament from firefighters is that wildland firefighting and fire expertise is not recognized as a profession within the five agencies. Firefighters are typically classified as forestry technicians or some other category that does not reflect the true nature of their responsibilities.

The linkages of job title and image as a professional to safety are not obvious at first, but are real. First, an image of professionalism helps promote safety, as discussed in the preceding goal. Second, a positive, professional self-image creates pride and job satisfaction, and is a motivator to retain firefighters and build back needed experience levels. However, the key point is that professional stature need not be tied to a position description or job title.

The lack of recognizing and promoting a strong image of professionalism in firefighters is contributing to a growing dissociation between firefighters, Incident Management Teams, and the agencies that employ them. Because they are unable to systematically influence the policies that directly bear on their work, firefighters and others in the fire community create their own ad

hoc safety policy at the field level, often on the fireline. According to Withen's research,[5] "given their belief in [the need for] stifling the bureaucratization of their parent organization, firefighters use various counter-strategies." In other words, safety policy is being set at the fireline level to counter what is viewed as bureaucratic and inappropriate, frequently at odds with the stated objectives of the agencies. These informal policies are sometimes inappropriate, only intermittently effective, or even counter to what the agencies are trying to accomplish. Informal approaches to firefighter safety may end in tragedy; fire orders may be violated in the belief that the job cannot be done without doing so.

In some cases the agencies have "professionalized" Hotshot crews, Smokejumpers, and others through career appointments and other devices, without creating professionals who are empowered to influence their working conditions without acting against the goals of the organization.[6]

A number of firefighters and safety experts we interviewed believe that if the agencies expect professional thinking and safety behavior, then they must recognize the firefighters as professionals rather than skilled labor, and must promote an image of professionalism. Most firefighters found firefighting to require high levels of skill and knowledge, and considered firefighting to be their profession. Almost two-thirds (62 percent) of those surveyed said there would be some or much positive impact on safety by considering firefighters as professional firefighters rather than forestry aides and technicians or other general non-descriptive job categories.

The cultures of the five agencies have their own deeply embedded administrative and bureaucratic connotations to the word "professional." For most people in these agencies, "professional" means a member of a "professional job classification series" and by association, those with post-secondary degrees in some scientific or technical specialty. This cultural norm and the attitudes it embodies will present a serious barrier to making this change. The firefighters use the concept of professional in a different sense, more like that found in the dictionary, where the synonyms for "professional" are *expert, specialist, veteran, master,*

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[5] Patrick Withen, Lower Level Employees' Participation in Organization-wide Issues: Wildland Firefighters' Participation in National Fire Policy Formulation, Ph.D. Dissertation, Boston College Department of Sociology, 1994.

[6] Michael DeGrosky, Leadership, Strategy and Consensus: What it Will Take to Change the U.S. Wildland Firefighter Safety Culture, Proceedings of the Canada-U.S. Wildland Fire Safety Summit, International Association of Wildland Fire, 1997.

experienced, learned, masterful, proficient, capable, competent, and efficient. Few would argue that the agencies would not want their firefighters to be all of these things.

The firefighters' perspective that firefighting is a profession receives qualified affirmation from organizational theorists' view of professionalism. For example, Ritzer and Walczak[7] believe that for an occupation to be classified as professional, it must have:

1. A body of general systematic knowledge
2. The norm of autonomy
3. The norm of altruism
4. The norm of authority over clients
5. A distinctive occupational culture

Firefighters certainly have attributes 1, 3, and 5. Firefighters have attribute 2, autonomy, only in part. They may not have attribute 4, authority over clients, but neither do doctors or lawyers in any absolute sense either. In firefighting, the public, and in some cases private landowners, are the client. While firefighters have a greater amount of autonomy on-the-job than do most lower-level employees, the level of their autonomy is not comparable to that of the full professions.

When measured against Ritzer and Walczak's qualities, firefighters in Type I crews theoretically represent at least a "semi-profession" in that they do not fully possess all of the attributes listed above, but do possess most.[8] Most other wildland firefighters are at some lesser level of professionalism.

Lower-level firefighters have no widely recognized status as professionals within the firefighting agencies. Ironically, it appears that the general public regards firefighters as professionals more so than the agencies themselves. Within the agencies, it is readily apparent to lower-level firefighters as well as to Incident Management Team personnel that most firefighters are viewed as temporary workers with status comparable to lower-level employees in the wider economy such as laborers and service employees.

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[7] George Ritzer, and David Walczak, (1986), *Working: Conflict and Change* (3rd ed.), Englewood Cliffs, NJ: Prentice-Hall.

The body of knowledge that firefighters utilize is less comprehensive and specialized than for the full professions. Firefighters in most Type II crews receive only one week of wildland firefighting training. As rookies, firefighters in Type I crews receive between two and six weeks of training. Each year, the firefighters in Type I crews receive a week of refresher training, but some firefighters receive only 8 hours. The body of knowledge continues to grow and is significantly higher than that of lower-level workers in the general economy, but training is significantly shorter than it is for the full professions.

The depth and content of wildland firefighter training have been brought into question by numerous authors, including the Incident Management Review Team assigned to the South Canyon incident. Elsewhere in this report we recommend an interagency fire management apprenticeship program and numerous enhancements to the training curricula, further expanding the body of systematic knowledge employed by firefighters, moving toward making it more of a profession.

Most firefighters *feel* that their job is a profession.[9] Many firefighters speak of the fact that when they observe Type I crews in action or in training, "they looked very professional." In such situations the firefighters were referring to a number of attributes that gave them the impression of professionalism. Some were attributes related directly to the theoretical conceptions of professionalism as listed above. Training is frequently seen as an important aspect. The fact that the training is often viewed as being extensive and difficult to complete successfully gives firefighters the feel of professionalism. Many firefighters speak of the professional responsibility that comes about from being in charge of a fire. The autonomy and independence of action of the firefighters makes them feel self-reliant.

The work discussed above of Ritzer and Walczak, Etzioni, and others provide the "structural" or organizational view of professionalism. The feeling or sense of professionalism that is shared by firefighters and by many others in the semi-professions (and presumably aspiring semi-professions) reflects what Hall designates as the "attitudinal" side of professionalism. According to Hall, characteristics of a professional attitude include:[10]

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[8] Amitai Etzioni, (Ed.) (1969), The Semi-Professions and Their Organization: Teachers, Nurses, Social Workers, New York: The Free Press, p. 5.
[9] Richard H. Hall, "Professionalization and Bureaucratization," *American Sociological Review*, Vol. 33, No. 2, February 1968, pp. 92, 104.
[10] Patrick Withen, 1994, op cit.

1. Use of the professional organization as a major reference
2. A belief in service to the public
3. A belief in self-regulation
4. A sense of calling
5. Autonomy

Doctors, lawyers, and accountants all embrace professional organizations and independent regulatory bodies such as Bar Associations and the American Medical Association. Service to the public represents the belief that the service provided by a profession is vital to the functioning of society. So strong is the sense of the service to the public that the professions believe they must be able to regulate themselves with minimal outside interference or regulation. The sense of calling represents the professionals' dedication and commensurate inspiration concerning their professional endeavors. An attitude of autonomy represents their belief in self-regulation and a sense that they must exercise total responsibility for their client, sometimes even in lieu of the wishes of the clients themselves.

The practical side of professionalism may be seen in occupations such as urban firefighters, and in lower-level medical employees such as nurses and medical technicians. In these instances we see many of the qualities of professionalism as described above. In most cases, these semi-professionals must pass a general examination, they largely function independently of higher authorities, they recognize themselves and are recognized by the public as having narrow, specialized skills, and they have self-regulating oversight agencies.

In light of the above considerations of what constitutes being a professional, the following goal was set:

Goal 59. Recognize and promote the image of the professionalism of wildland firefighters.

Implementation Strategy 1 – Define the concept of being a professional firefighter.

The agencies must collaboratively define the professional work ethic they want, and systematically infuse their organizations with that work ethic through training, leadership, supervision, and effective organization. The concept of professionalism must include intolerance for unsafe work practices, and empowering people to influence their working conditions without acting against the goals of the organization. This strategy should be implemented in concert with Goal 58, which encourages the agencies to identify and promote a skill set that constitutes a

professional approach, and in concert with all of the goals that call for increased training and an increase in the "body of general systematic knowledge" available to all firefighters.

Implementation Strategy 2 – Refer to firefighters as firefighters, regardless of their job series.

The issue here is to help promote the concept of professionalism. The simplest, and most direct change that could be made to promote the professional image of wildland firefighters would be to refer to them as firefighters, fire control specialists, fire management specialists, or some similar term rather than as forestry technicians or the like. However, establishing a professional firefighter occupational series per se has a negative side that many have ignored: there would be a potential requirement to work 56 hours before overtime kicks in, and a lack of hazard pay.

Many of the implementation strategies recommended in this report will enhance the professionalism of wildland firefighters even without a formal job reclassification. They would be more readily accomplished if a name change could be made without negative pay consequences. Firefighters would view this reclassification effort as an important and significant step which, perhaps more than any other, would symbolize that administration is serious about improving professionalism and firefighter safety. An alternative is to make sure that firefighters are referred to by a fire-related name (not forestry technicians), regardless of the title on their position descriptions, as is done with many other Federal jobs.

Some titles would apply to people while working as firefighters apart from their main job. They can be called an engine captain, for example, while on fire duty and then return to their main job title the rest of the year. Many participants in the study felt that at the minimum there should be firefighting ranks and positions used while firefighting. Engine crews in particular have expressed this concern.

Part of the issue of feeling and acting like a professional is being paid like one. If pay levels were raised enough for individuals to do better than they do now, considering overtime and hazard pay, then a true reclassification would be best. (Pay is discussed further in this chapter as part of the discussion of retention practices.)

Implementation Strategy 3 – Expand firefighter duties to include prescribed fires.

The Forest Service and other land management agencies intend to significantly expand their prescribed fire activities. This will allow firefighters to expand their experience and

knowledge, and add weeks of time to the season for professional firefighters. This would also promote firefighter retention. (See also Goal 13, which leads to greater safety by keeping a core of experienced, professional firefighters.) Prescribed fire and the preparation for it would enhance skills such as fire prediction, situational awareness, risk management, and so on.

Implementation Strategy 4 – Expand other job duties and cross-training among lower-level firefighters.

Job enlargement, job rotation, and cross-training should become routine. A general expansion of job duties including the addition of prescribed fire duties to the firefighters' roles would benefit firefighter safety in two ways. First, in highly complex organizational settings such as wildland firefighting, it helps efficiency and safety if each actor (individual or group) understands the roles, capabilities, and limits of each other actor.

Second, one of the main roadblocks to professionalizing wildland firefighting and to granting more authority to wildland firefighters has been the perception that wildland firefighting was a part-time summer job. In this context the college student was seen as the ideal worker, since he or she would want to fight fire only when college was out, i.e., in the summer. In more recent times, given the complexity of firefighting and the lengthening of such historic fire seasons as 1988, 1994, and 1996, college students are seen as less than ideal because many universities have gone to semester systems and fire seasons last too long. The ideal wildland firefighter is one who is willing to work about four full months, and then be willing to find other means of livelihood.

This implementation strategy is also needed for Goal 13, which deals with firefighter retention. Expansion of cross-training would offer firefighters more duties with which to expand their time beyond the average four month stint, perhaps by several weeks each year.

Implementation Strategy 5 –Increase the autonomy of firefighters to adapt to conditions.

As discussed in the introduction to this section, Ritzer and Walczak found that one of the five attributes of a professional was "a norm of autonomy," control over how they perform the details of their work.

Jon Driessen, a sociologist at the University of Montana, found that an excellent crew with good teamwork has the following qualities:[11]

- Dividing up the labor
- Listening and learning
- A good attitude
- Cooperation
- Making decisions together
- Watching out for one another

Richard Daft has explored so called self-directed teams.[12] These teams rotate jobs, produce the entire product, and assume managerial functions. Self-directed teams have:

- Access to resources
- A range of skills sufficient to perform a major organizational task
- Decision-making authority

The recognition of autonomy as being critical to the definition of professionalism (according to the above cited research and by the firefighters themselves) is based on the rationale that many tasks are so complex that they cannot be safely managed by any outside authority. Rather, the actor(s) carrying out a task are more capable of making safe and efficient decisions than anyone else. Only the professional engaged in that given task can be responsible ultimately for his or her activity. If not, that person is not trusted as being a professional.

"Autonomy" or "self-direction" for a firefighting crew is translated into details such as changing where a segment of line gets dug in light of localized hazards such as exposure to spot fires that were not reflected in the incident action plan. We are not suggesting that a crew should unilaterally diverge from the set tactics, but rather that it should be allowed to adapt to changes in conditions or conditions discounted after a plan was made or orders given, but still consistent with the overall objectives. Some division supervisors are said to "come unglued" when a crew

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[11] Missoula Technology and Development Center, Making a Crew: Part I: Putting a Crew Together, Jon Dreissen, Project Leader, 1E12H82, Work Crew Orientation, April 1995.
[12] Richard Daft, Organization Theory and Design, (5th Ed.), NY: West Publishing Company, 1995.

does not follow the plan exactly. Of course the Crew Supervisor can consult with the Operations Section Chief or Division Supervisor before changing course of action, when possible.

As the system is organized now, authority is split for safety and task accomplishment. While Incident Management Teams are responsible for organization, task accomplishment, and so on, ultimate authority for safety is seen as being dispersed to all firefighters, thus attempting to professionalize safety. However, it is impossible to disperse authority for safety while simultaneously concentrating authority for task accomplishment (what one actually does) in the hands of the Incident Management Team; safety and task accomplishment are intimately related.

Implementation Strategy 6 – Develop a larger corps of professional firefighters.

Safety is affected not just by having adequate numbers of firefighters, but also by the professionalism and size of the cadre around which the firefighting force is formed. Increasing the numbers of Type I crews would increase the number and proportion of highly trained and motivated firefighters to handle complex firefighting tasks safely.

Increasing the numbers of Type I crews also would help maintain a critical body of knowledge and experience within the wildland firefighting community by training a core of highly experienced firefighters. Since many firefighters in Type I crews would be drawn from the urban population or from a rural population that does not necessarily have "woods knowledge," their higher level of skill and experience would have to be gained though increased training and cross-training.

As recognized by firefighter comments in Phase I of this study, people in Incident Management Teams today have less depth in experience and knowledge than their predecessors a generation ago. An increased number of Type I crews would generate a larger body of personnel from which to draw experienced fire management in the future.

Lastly, larger numbers of Type I crews would increase the percentage of fires successfully suppressed with initial attack forces. Currently about 3 percent of fires escape initial attack. With a larger number of Type I crews, this rate probably could be further reduced. Escaped fires cost millions of dollars each and cause many firefighter injuries.

Implementation Strategy 7 – Expand cross-training of a core group of firefighters.

In addition to increasing the numbers of Type I crews, the agencies should cross-train a core group of firefighters to function as Smokejumpers, Hotshots, rappellers, and helitack. The "core of the corps" would provide the highest professional role model for other firefighting resources. This strategy would also decrease inter-organizational rivalry (which often leads to competition and unsafe practices) as well as decrease inter-organizational confusion about roles, and tactics between specialists.

By cross-training firefighters, the agencies would create a corps of the most highly trained and experienced firefighters yet seen in wildland fire suppression. Allowing professional firefighters this expanded training would add training time to each fire season, encouraging greater firefighter retention, another goal (13). Greater retention in turn creates improved firefighter safety by increasing experience. This strategy, coupled with greater numbers of Type I crews and an interagency apprenticeship program would create *a critical mass of professionals and role models to lead firefighting agencies and their lower-level firefighters into better attitudes and safety-related practices.*

Implementation Strategy 8 – Promote the concept of a professional "attitude of wisdom."

The strategies listed above to increase professionalism deal with expanded training, knowledge, experience, and autonomy. The connection between these strategies may be visualized as a framework in which Weick's concept of "the attitude of wisdom " in firefighting can be realized. "Wisdom" is the quality of having expert knowledge accompanied by an understanding that "knowing that what one knows is usually incomplete and fallible, and that acting on that fallible knowledge involves a tricky balance between knowing and doubting."[13] Dr. Charles Perrow, a sociologist on our study team, has advocated the need to teach firefighters the limits of cognition, the way one can be fooled into thinking you understand the situation but don't; i.e., the problem of human fallibility.[14]

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[13]Karl Weick, "Wildfire and Wisdom," paper presented at the Canada/US Wildland Fire Safety Summit of the International Association of Wildland Fire , September 29, 1997.

[14] Dr. Charles Perrow, "Developing a Cooperative Approach to Wildfire Protection," paper on how to change the culture, presented to the Federal Fire and Aviation Leadership Council meeting, Boise, Idaho, TriData Corporation, January 6, 1998.

Weick argues that for firefighters to realize or express their wisdom, they must "shift their confidence from their knowledge to their skills of improvisation." Improvisation is seen not as acting impulsively but rather as "making sense out of previous experience, practice, and knowledge," and applying it appropriately. Wisdom and improvisation are vital components of professional activity that must be realized in today's wildland fire suppression efforts if we are to fight fire aggressively, but provide for safety first. The "attitude of wisdom" is directly related to decision-making under stress, which is discussed later in this chapter. The former comes from a sociologist's framework, the other from a psychologist's viewpoint.

Substance Abuse

Respondents on the Phase I firefighter safety survey identified substance abuse as an ongoing problem, though it is not rampant. However, many thought there were some problems. A quarter of all respondents (and over half those from BIA) who gave an opinion thought there was a problem, especially at incident bases and camps. Being drug-free and sober must be another tenet of professionalism.

Goal 60. Maintain a zero tolerance policy for substance abuse at fires (including bases and camps).

Implementation Strategy 1 – Enforce the existing policy.

The agencies currently maintain a policy of zero tolerance for illegal drug use and substance abuse, and generally do an adequate job of enforcing this policy. The agencies must enforce this policy even more vigilantly than in the past, to move closer to 100 percent compliance. Ensure that initial and refresher training address the policy, its purpose and intent, and the consequences of violation. Officials at incident bases need to remain alert to this issue. On-the-job substance abuse can represent an extreme threat to safety.

Implementation Strategy 2 – Provide education on the policy and the need for zero tolerance.

Bolster the "zero tolerance" policy with an educational campaign in basic firefighting courses and at incident bases. The campaign should, at a minimum, reinforce the following points:

- Substance abuse can be an extreme threat to safety.
- Even "legal" drinking the night before a day on the fireline can threaten safety.

- Hangovers mean dehydration, slowed mental processes and impaired physical skills, all of which put your life and the lives of your fellow firefighters on the line.
- Illegal drug use and substance abuse will not be tolerated.

Implementation Strategy 3– Include alcohol and drug testing for fatalities and serious injuries.

Testing for alcohol and drugs is part of the U.S. Fire Administration's standard protocol for firefighter fatalities, and should be done as soon as possible after a fatality as part of the investigation and autopsy.[15]

Alcohol and drug testing should also be done for any serious injuries, not only to see if substance abuse was a factor, but also to help guide treatment. For example, treatment of burn victims who are known to be alcoholics may be provided for differently from others.

Implementation Strategy 4 – Include being sober and drug-free as part of professionalism.

As part of promoting professionalism in the strategies in Goal 59, part of the concept should be that professional firefighters must not be involved in substance abuse to do their job well, and for their own safety and health.

Situational Awareness

According to the findings of the 1995 Wildland Firefighters Human Factors Workshop, basic situational awareness is highly dependent on good information, skill, and experience. Situational awareness is one of the most difficult skills to master and is a weakness in the fire community. One cannot mandate situational awareness. The culture must change so that people are observing, thinking, and discussing the situation constantly. People at each level of the fire organization must understand the unique aspects of remaining situationally aware in their role. This leads to the following goal:

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[15] Some religions and cultures do not permit autopsies. In most cases, these feelings can be respected, though there may be exceptional circumstances.

Goal 61. Do what it takes to achieve and maintain situational awareness at each organizational level.

The many goals that address clarifying information, providing better information, increasing experience, and improving the realism of training all will contribute to improving situational awareness. (See, for example, the strategies under Goals 19, 20, 21, 26, 32, and 66.) In addition, the following strategy is suggested:

Implementation Strategy 1–Teach techniques for maintaining situational awareness in training courses from firefighter to Incident Commander.

The findings related to situational awareness contained in the Human Factors Workshop report should be incorporated into the training curricula and operational guidance.[16] They are contained in the section called "Fire Management, Incident Management Teams, and Fire Crews in a Crew Resource Management Context" in that report and are quite specific.

At the crew level, there tends to be good situational awareness of the immediate fire circumstance, but less awareness of the big picture and what to expect in one hour, two hours, or during the next operational period. At the higher levels of the Incident Management Team organization, the command structure, there may be good information on the big picture, but poorer information on the fire situation faced at the crew level.

Situational awareness must be practiced by every level, not just Crew Supervisors or incident commanders. As one firefighter put it, "Everyone is in a situation and needs skills to stay aware and awake." Personnel at each level must know the elements that need to be tracked to create adequate situational awareness, such as weather, predicted fire behavior, current overall fire situation, special hazards faced, location of escape routes, location of safety zones, and the location and status of one's assigned personnel and resources.

Training courses should specifically require personnel to identify the key elements of situational awareness for their current and potential next position, and how to interpret and use the information. Also needed is practice and skills for dealing with too much information (information overload) – how to select what is needed and ignore the rest.

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[16] Human Factors Workshop Report, Op. cit.

What also must be taught is recognizing what you don't know but need to know, and how important it is to find out versus continuing without the information. (Practicing this is recommended later as part of training in decision-making under stress.) Also critical is learning the dangers of false analogies to previous situations – you think you've seen this before, and know how to act, but in reality the conditions are different (e.g., normal humidity last time, very, very low humidity this time). We need to strip any sense of validity from the comment: "But it would have worked in a normal season!"

Weather is an especially critical element of situational awareness. Wildland firefighters need to know which way the wind is blowing, literally as well as metaphorically. But in addition, they must know how to interpret and react to weather information. A less obvious but also critical need is knowing the location of crews relative to each other, which is addressed in the next goal.

Goal 62. Good communication is needed between crews working in proximity, especially one above the other.

Implementation Strategy 1– Mandate that crews and division supervisors be informed of the location of crews near each other.

Crew and division supervisors should be told as part of briefings the location of the crews nearest each other, and especially crews or any resources such as bulldozers working one above the other. They then need to validate this information – what they were told may have been erroneous or garbled.

Implementation Strategy 2 – Keep crews working at different elevations near each other in radio contact and informed of each other's plans.

A crew at a higher elevation can dislodge rocks and even firebrands on the crew working below. Likewise, the crew below cannot be setting backfires without making sure there is no crew above if the fire has the potential to threaten the higher level crew. Communication between crews is imperative in such potentially dangerous situations. Continuing knowledge of the positioning of crews above and below when working on slopes should be a key part of situational awareness. Each member of the crew, not just the supervisor, must be aware of the other crew's location.

The importance of maintaining good communication between crews working in proximity is well known in the fire community and has been an objective of basic firefighter

safety training for many years. Nevertheless, both in interviews and in the survey participants in this study raised it as a frequent problem. The agencies should ensure that the S-110 (Basic Fire Suppression Orientation), S-130 (Firefighter Training) or other appropriate courses treat this topic adequately. Any injuries resulting from lack of coordination should be cause for review and possible disciplinary action.

Extra Awareness in Drought Years – During periods of extended drought, multiple fires often exhibit extreme fire behavior characteristics that pose high threats to life, property, and natural resources. Severe conditions can develop rapidly. It is a particularly critical time to maintain situational awareness. Fire management organizations need a comprehensive system in place for tracking fuel and fire behavior potential throughout the affected region – "a fire behavior service center"– and getting the relevant information to all the right people. For the most part this already is a standard operating procedure involving GACGs, the weather service and others. This information needs to be provided to all affected regions. While often available at the fire level, the information is not always organized at the region level. In the absence of current information regarding critical fire behavior potential, personnel on the firelines may be caught off guard by sudden increases in fire spread rates, spot fires, and fire intensity. Senior managers and Incident Commanders leaving fires need to be debriefed, and have the information shared.

Recognizing the practical value of gathering, interpreting, and disseminating extreme fire behavior information during multiple fires, the "Fire Behavior Service Center" concept was first used on a regional basis in Montana in 1984. The concept now has been applied to other regions during drought conditions; and has on several occasions been thought to have saved firefighting personnel from injury. Although the concept has been applied to other areas in the country, activation of such a center under drought conditions is not yet as routine as it might be. This leads to Goal 63:

Goal 63. Take extra safety measures in drought years.

Implementation Strategy 1 – Activate regional interagency Fire Behavior Service Centers during drought years to increase available information and raise awareness.

Regional interagency fire centers should activate a Fire Behavior Service Center when their area experiences conditions of extended drought, outbreaks of multiple fires, or when for other reasons high fire spread rates and fire intensities pose distinct threats to life, property, and

natural resources. The Service Center should be staffed by Fire Behavior Analysts (FBANs) and other qualified fire behavior specialists. A minimum of at least two FBANs per center is needed to allow those individuals to alternate between office and field responsibilities, and to provide sufficient hours of coverage for data collection, interpretation, and briefings.

The purpose of a Fire Behavior Service Center is not to duplicate or replace the functions of FBANs on individual incidents. Rather, the staff of the Service Center provides ongoing support to FBANs on major fires, and provides support to FBANs in the field, and fire behavior overviews to dispatch and command organizations. The Service Center generally is attached to a regional or interagency coordination center, although in 1988 a Service Center was attached to Area Command in West Yellowstone due to the severity of conditions there.

Specific functions of the Service Center include the following:

- Map fire behavior severity zones in the region.
- Update daily measurements from Remote Automatic Weather Stations.
- Update and track burning indices, energy release components, and 1000-hour fuel moistures for geographic areas.
- Gather, plot, and display wildfire perimeter data for all large fires.
- Prepare daily Fire Behavior Situation Reports for briefings and distribution to field units and Incident Management Teams. (This information should also be sent to any geographic areas which are likely to provide additional firefighting resources so that those resources are aware of the conditions to which they are headed.)
- Regularly provide fire behavior briefings for coordination groups, media, Incident Management Teams, and others. Some of this information comes from debriefing people at or leaving fires.
- Conduct reconnaissance flights of major fires with video support to document fire behavior conditions.
- Maintain two-way communications with FBANs on incidents.
- Issue Fire Behavior Warnings as necessary to report severe fire behavior events likely to occur in the next 24 hours based on anticipated changes in fuels or weather conditions.
- Issue Fire Behavior Alerts as necessary to report dangerous conditions observed on an ongoing fire that may be applicable to other fires.

The Fire Behavior Service Center concept has proven useful for informing fire management and crews of potentially dangerous fire behavior events associated with drought conditions. The concept needs to be more widely implemented as an additional safeguard to the welfare of firefighters. The service center concept would become especially important if the National Weather Service further reduces its fire weather forecasting staff.

Implementation Strategy 2 – Use other, less formal ways to keep firefighters informed about conditions.

There are other, less formal ways than Fire Behavior Service Centers to keep firefighters and fire managers informed of drought and extreme fire behavior situations. These include special warning bulletins, and briefings to new arrivals from out of the area. (This can be part of the improved briefings recommended under Goal 4-16.) In 1994, for example, the Southwest Region of the Forest Service issued a special fire behavior report to all firefighters who might be dispatched to southwest fires, warning of the especially dry conditions coupled with the widespread distribution of ladder fuels. People being mobilized to the southwest knew in advance to be on guard against the high probability of high intensity crown fires.

Many tools are available today for assessing wildland fire behavior potential, including fire danger maps, fire weather forecasts, dead fuel moisture maps, vegetation greenness maps, Keetch-Byram Drought Index maps, Palmer Drought Index maps, and Lower Atmosphere Stability Index maps. Field units and fire coordination offices can fulfill an important role in safeguarding firefighters by collecting, interpreting, and distributing such information to fire personnel in a timely and consistent manner. Once again, it is frequently but not always being done.

Training

Training is a key aspect of the organizational culture that needs significant change. Almost everyone interviewed saw training as a significant source of solutions to fireline safety problems and was in favor of more or better training in the classroom and more hands-on training in the field. Survey respondents indicated that major changes were needed in the quality of training, the frequency of training, the access to training, and most of all, the realism of training. Before discussing the goals dealing with improving training, we discuss the background of the problems with the current training system, which has been very good but needs to be improved:

Specific Training Issues

We identified at least 12 separate training issues in the course of this study. To fully understand the goals and strategies related to training requires a brief review of these issues.

Emphasis on Certain Positions. As discussed in Chapter 4 with respect to improving leadership, participants in this study identified Crew Supervisors as the position most in need of better training. Crew Supervisors are the final line of command, and therefore, the final determinant of crew safety, as tactical orders are passed down the chain of command. They need to combine technical information and leadership know-how. In addition, they must work within an environment that allows them to ask for information and allows them to comment on the safety of the assignments given to their crews.

Next after Crew Supervisors, respondents most frequently cited the need for better training of Type II crews as a safety concern. There were concerns that seasonal employees receive less training than they used to get because of shorter seasons. Additionally, the amount of training for Type II crews varies widely. Attention needs to be given to those receiving minimal training but receiving a full range of fire assignments.

Close behind in need came Agency Administrators. A third of those polled felt that administrators were one of the highest priorities for needing further training. Among the Agency Administrators themselves, a third thought they needed better training the most of any position.[17]

Hands-on Practice. The need for training to include more hands-on practice was the strongest consensus need for improving training. This includes senior level courses in incident management as well as firefighting skills.

Urban/Wildland Interface. Study participants strongly agreed on the need for more training related to safety on interface fires – how to establish escape routes and safety zones in the urban/wildland interface, and the special hazards associated with structures and the areas around structures, such as propane tanks.

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[17] Within the past year there has been a surge of interest by Agency Administrators in taking fire-related courses at the training facility in Marana, Arizona, so the situation may be changing.

Frequency of Training. Most study participants felt that conducting safety training once in the Spring was not enough, especially for seasonal firefighters. The training sometimes is curtailed and sometimes is cut out altogether.

EFF Crews. About 25-30 percent of the firefighting workforce are hired as Emergency Firefighters (EFFs) on a call-when-needed basis. Most of them receive minimal training and are not readily available for additional training. Many EFFs who are trained never get to a fire.

Real-time Emergency Decision-making. As noted in several places in this report, real time decision-making at the crew level is considered by some experts who have studied crew behavior (e.g., Putnam) as a critical factor in determining whether a crew successfully avoids or escapes danger. Three-quarters of the survey respondents agreed that training in real-time decision-making is a need. This is such an important need that it is addressed in a separate section following the other training goals.

Management of People. Three-quarters of the survey respondents felt that supervisors of EFF, inmate, and other Type II crews need better training on how to manage people. (There was general agreement that Crew Supervisors are taught the technical aspects of the job.) The effectiveness of crews is highly dependent on the quality of the Crew Supervisors, and their ability to lead and train the crew on-the-job.

Training as Substitute for Experience. We frequently heard the complaint that the agencies have to use training as a substitute for experience, but the present form of training is not realistic enough to be a good surrogate. There was a call for more field work, more computer-based simulations, and more training using realistic scenarios for Crew Supervisors, Incident Management Team members, and senior managers.

Shortage of Qualified Trainers and Variation of Course Quality. Survey respondents and many of those interviewed felt there was a shortage of good, qualified trainers with solid fire experience. Over 80 percent of survey respondents cited variation in the quality of instruction between instructors, organizational units, and geographic areas as a problem.

Completeness of Training. About 60 percent of respondents thought training was rushed or incomplete. Permanent employees felt even more strongly than did the seasonals that training courses were often incomplete and rushed.

Training Availability. A number of firefighters and fire managers interviewed felt that either the types of wildland fire training they needed were not readily available or they were not allowed to attend the training by their home organizations.

Shelters. During the interviews, we heard strong comments about the need to improve training on the use of shelters. About half of the respondents on the survey agreed that it was a problem. Experienced firefighters said that instruction on the deployment of shelters is too often done under benign conditions, such as the front lawn of the training facility or indoors.

Training Improvements

Improvements in training are needed to help reach the majority of goals discussed in this report. Many goals have implementation strategies that involve improving training.

One of the functions of training is to act as a vehicle to instill professionalism and the organizational culture. Training connects the participant with the tenets of the organizational culture not only through the content of the training but also by combining the rituals of training with the investment of personal time and effort. Training should include many anecdotes or stories illustrating the values that help to create the culture of professionalism. The breadth of the fire training curricula must also be expanded to better prepare fire personnel to function as a team, lead and supervise effectively, and most importantly, communicate. It must include the interaction of people and concern for human factors as well as the technological side of training.

In addition, the agencies must assure that key concepts such as situational awareness, risk management, crew resource management, leadership, interpersonal communication, and tactics are taught systematically and comprehensively.

Thus the path to improved safety performance is through cultural change and the path to cultural change requires, in part, changing how the agencies train and certify people. To summarize the overall training needs:

- Training must be more accessible to all.
- Training must be more realistic, including simulations, case studies, field exercises, and training in field settings.
- Training technology and delivery platforms must be modernized.

- People must be taught how to conduct on-the job training and OJT must be used much more than it is.
- People need to train in the context of their work.
- The training and certification system must regain credibility with tougher certification requirements.
- The agencies need to teach people how to maintain situational awareness, recognize danger, and make decisions that are "primed" by that recognition.
- There needs to be a unified training strategy that goes beyond unified standards and interagency training courses, which already exist, to include joint administration, more pooling of training resources, and joint analysis of needs.
- Desired competencies need to be established based on analysis of workload and responsibilities. Core competencies need to be integrated into the agency personnel systems (position descriptions, selection criteria, annual evaluations, compensation, etc.). There has been much progress on doing this.
- The number of people who need training and experience to achieve those competencies needs to be determined, along with the requisite number of training courses and trainers.
- Funding of training programs needs to be adequate for obtaining the desired competencies and meeting expected workload.
- Some ways must be found to improve training of the 6000 or so EFFs who are less accessible than other employees.

In light of the above, the following set of training goals (Goals 64 through 75), should be viewed together with the specific recommendations for training in connection with other goals throughout this report.

Goal 64. Training should be available, high quality, and consistent.

Implementation Strategy 1– Develop a needs-based strategy for training across agencies (i.e., matching training availability to the quality and quantity of training needed).

The agencies should adopt a common method for producing a needs-based training strategy that does the following:

- Identifies needed fire competencies through workload analysis and integrates core competencies into agency personnel systems.
- Analyzes agency needs for the various types and quantity of incident and prescribed fire positions, including all positions listed in 310-1 (Wildland Fire Qualifications Subsystem Guide) and 310-2 (the prescribed fire portion of the guide). Assure that the agencies collectively have enough trained people to get the job done safely as well as effectively. That is, once you've figured out the needs, make sure your training system will meet them. This should go without saying, but the training planners self-assessment is that they do not feel this has been achieved yet.
- Assure an adequate training and coaching cadre (enough trainers). Consider using alternative approaches to training delivery (such as community colleges, vo-technical schools, contract trainers) to make up for shortfalls, and for increasing training efficiency.

The needs-based training strategy should be implemented on an interagency basis. The agencies need a comprehensive approach that:

- Provides for each agency to cooperate in developing an interagency needs analysis for consolidation at the geographic zone, and ultimately for consolidation nationally by the NWCG. Some agencies in some zones currently make interagency assessment of annual training needs through geographic area committees, a step in the right direction. This needs to be done in all zones for all agencies.
- Assesses impacts of the planned increase in prescribed fires on the ability to meet wildfire incident demands (because they involve most of the same people.)
- Considers training of "non-traditional" staffing sources that might be used, including the Department of Defense, Army Corps of Engineers, contractors, rural fire departments, GSA, etc.
- Ensures that all efforts are jointly planned or at least fully coordinated – a national effort to avoid redundancy and maximize use of precious training resources.
- Develops and funds a tracking system for national qualifications that permits the ability to cumulatively assess ("roll-up") numbers without double-counting a person

who has multiple certifications. Agency tracking systems should be fully compatible, allowing "roll-up" by the National Interagency Fire Center.[18]

The computer application software already exists to implement a tracking system for national qualifications through the Department of Interior's Shared Application Computer System (SACS). However, differing agency priorities have stalled the initiative begun by the National Park Service and Bureau of Indian Affairs. The Forest Service continues to invest in its own system, and the states handle their training and qualifications in a variety of ways. All five agencies (through NWCG) should put a priority on a computerized system that:

- Creates compatibility and "roll-up" capability by integrating the Interagency Qualifications System (IQS), the tracking systems employed by the Interior agencies, and the system used by the Forest Service.
- Determines national, regional and geographic zone position shortages based on historical staffing for the 85th or 90th percentile of fire potential (i.e., a severe fire season).
- Allows each agency to individually identify its incident management and prescribed fire position needs by zone, region, and service-wide, taking into account required redundancies for availability, transfers, retirements, etc. (For example, it may require three qualified people to cover each required position).
- Rolls position need numbers up into a shared-application, national database that identifies the number of qualified people (by position) currently within the system and position shortages (by position).
- Identifies individual people who are within five to seven "training levels" of qualification for positions in critically short supply, and their individual training and experience needs to reach the position in short supply.
- Sees that course needs are represented in the development of agency and interagency training budgets.

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[18] As noted earlier, this was said to be in progress under the auspices of the NWCG. Another system that lists who is qualified at each level is in place for DOI – the SACS system. The Forest Service has its own system. A state and other non-federal personnel system is being developed under NWCG. Ultimately, the data bases from the three systems need to be melded together.

Implementation Strategy 2 – Develop a common approach to certifying instructors.

The agencies should develop a common system for training and certifying instructors consistent with the standards established in the NWCG Course Administrator's Handbook. Also needed is a computerized, interagency instructor database to track instructor qualifications, experience, and evaluations. This database must be available to all agencies. It could be located at the National Interagency Fire Center or the National Advanced Resource Technology Center.

Goal 65. Accelerate learning by emphasizing the positive lessons from successful incidents, not just the negatives from failures.

Implementation Strategy 1– Identify positive case studies for use in training.

Goals 4 and 14 discussed the need to identify "lessons learned" from successes and failures, and to distribute them through courses, newsletters, word-of-mouth, and other means. The part of this that is easy to ignore is identifying good positive examples.

The agencies should identify successful incident operations and use the positive lessons from them to develop a series of case studies for use in courses, self-study, and simulations, The case studies/simulations show what happens when people make good decisions. Simulation case studies can provide even stronger lessons than paper-based or video case studies. The case studies developed for the "Fatality Fire Case Studies"[19] course are oriented to learning from tragic failures but provide effective examples of the use of case studies. Positive examples should be added to the negatives.

If a Center for Lessons Learned is implemented, as recommended in Goal 4, that can be a prime repository for the positive examples.

Implementation Strategy 2 – Reward and publicize people involved in making exemplary decisions.

Recognize and reward the people involved in making exemplary decisions so that they become positive, high-profile models. For example, Chuck Hartley (retired Superintendent of the Dalton Hotshots) was given an award during the 1997 Canada-U.S. Wildland Fire Safety Summit meeting that not only recognized his career of achievement, but specifically his actions

[19] Formerly the "Firefighter Survival" course.

on the 1966 Loop Fire, where he refused an assignment, and spared his crew the fate of another crew which took the assignment and was burned over, with multiple fatalities.

See also Goal 14 (ways to enhance training to compensate for lack of experience).

Goal 66. Training needs to be made more realistic.

Implementation Strategy 1 – Increase use of realistic field training and exercises.

Contemporary research shows that adults learn best by doing rather than listening. Much of the current fire training curricula is listening oriented, supported by paper-based classroom exercises. Whenever possible, tactical training should be reinforced by realistic field training exercises and/or simulations. Highly realistic training is the objective.

The current revision of the training system is underway and projected to be complete in the year 2000. Incorporating the training strategies discussed in this report should be considered. Prior to the next revision, the agencies (through NWCG) should have an educational consultant (such as Boise State University) research the agencies' target audiences (current and projected workforce demographics), make recommendations on how the agencies' target audiences learn best, and revise delivery methods accordingly.

Going further, the agencies should conduct firefighter, squad boss, Initial Attack Incident Commander, and Crew Supervisor training using a "field academy" concept – training in an incident base environment. Field exercises should be used for skill training at the firefighter, squad boss, initial attack IC, and Crew Supervisor levels. Examples of skills suitable to be taught in that setting are line construction, orienteering, use of chainsaws, size-up, engine and pump operation, and fire behavior.

Implementation Strategy 2 – Develop more case studies and simulations based on real fires.

Case studies have been called a crucial way of extending people's experience. The agencies should develop a series of case studies designed around real fires. Effective examples abound. For example, Duncan Campbell (Saskatchewan Forest Fire Management Branch) has developed the South Canyon incident into a training case study. Campbell's case study would also make an excellent simulation. This case study could be used at the Crew Supervisor level to teach and reinforce critical skills such as decision-making and application of risk management principles. It could also provide a valuable simulation opportunity for the courses intended for

Incident Commanders Type 3 and 4. Agency Administrators could also benefit from decision-making training using this case study. The South Canyon fire's behavior has been extensively modeled through the incident investigation, and the results of that modeling could be incorporated in the simulation.

Scientists at the Northern Forest Fire Laboratory are developing case studies, based on the Dude, Mann Gulch, South Canyon, and Sundance fires, and others. The Loop, Crank, and Canyon Creek fires and an R-5 helitack incident also can provide high profile examples. (Most of these are in the new Fatality Fire Case Studies course.) The agencies should ask their most experienced firefighters and cooperators for lesser-known examples, including near misses, smaller fires, existing case studies, and positive examples (see Goal 65 for the latter).

Implementation Strategy 3 – Increase use of simulations and interactive exercises.

The agencies should intensify the use of simulation and interactive exercises at all training levels. Using simulations of case studies can reinforce the learning points of the case studies. (This also was discussed in Chapter 4 in connection with adding simulations to training to compensate for reductions in experience.)

Simulation and interactive exercises based on case studies of actual fires can be used to learn about specific results of decisions or actions (as is being done in the new Fire Fatality Case Studies course). If there is a choice to be made between paper-based or video case studies and simulations, focus on simulations.

As discussed earlier, simulations can involve role playing without needing complex simulation equipment. A simulation of fireline command could, for example, include reporting the fire status and the need for resources to dispatch, with responses back. Role playing rather than lecturing will better make the point that you need to inform the division supervisor or dispatch about this or that; the lessons will sink in better.

Implementation Strategy 4 – Conduct skills training "in context" of realistic scenarios.

The agencies should conduct more skills training in context (TIC). The key concept of TIC is that under stress, you will perform as you learned. Based on that premise, the training environment should recreate the context of the operating environment. Coach Vince Lombardi's observation that "Practice doesn't make perfect, perfect practice makes perfect" appropriately describes the intent of TIC.

More specifically, TIC is a highly structured method of training that provides an environment in which learners are coached as they visualize and walk through operational tasks, and then perform repetitions of that activity. The training structure recreates the elements of the operational environment and provides lots of coached learning in that environment. Tasks or performance elements are developed from defined operations and are arranged in sequence as they occur tactically or operationally, not by topic.

Training in context involves four steps:[20]

- Explanation of the operation including the objective of the tactic, tasks that make up the tactic, and safety issues.
- Providing firefighters with a vision of perfect performance of the tactics using an example by expert firefighters who demonstrate the desired performance standard. Firefighters are grouped by role (e.g., hose lay, or running a pump) and provided a coach to interpret and highlight the various parts and quality indicators of the tactic or skill being taught. The vision may be provided through the use of video or by demonstrating actual performance to standard. As the vision is presented, firefighters focus on the role they will play in performing the tactic.
- Perfect Process Practice with coaching. "Perfect process practice" means that the firefighter practices until he or she demonstrates the proper sequence of actions, and meets all technical skills and quality indicators without assistance of a coach in the time called for in the standard. The major portion of the learning occurs during coached repetitions. The coach provides immediate corrective feedback. Firefighters are stopped as soon as an error is recognized by the coach.
- Post-performance "Mental Rehearsal." Mental rehearsals are only slightly less effective than actual physical performance of skills. They are effective coaching tools. (Anyone who watched the Olympics will have seen many athletes with eyes closed and body swaying as they visualize their moves.)

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[20] As described in Montana Department of Natural Resources and Conservation, DNRC Wildland Fire Management Training, Training in Context System and Coaches Guide, August 11, 1997.

Implementation Strategy 5 – Provide realistic shelter training to all wildland firefighters.

Shelter training is often conducted only in a benign environment (e.g. on a lawn on a calm day). In reality, there may be rough terrain and wind blowing as well as time pressure to deploy. Therefore fire shelter training must be conducted under as realistic conditions as practical, considering:

- Terrain (e.g., a slope or rough terrain)
- Vegetation/ground cover
- Standard time limits for deployment
- Deploying while moving (executing escape route)
- In the wind (or using fans to simulate winds)

Conditions for sharing a shelter or refusing to do so must also be explained.

Implementation Strategy 6 – Make use of live fires and prescribed fires for training.

Live fire exercises and prescribed fires provide excellent training opportunities. The fires are real but under controlled conditions, allowing opportunities for inexperienced people to learn under the supervision of the more experienced ones. The planned increase in the use of prescribed fires could make this type of realistic training available to many more firefighters than was the case just a few years ago.

Implementation Strategy 7 – Improve quality of instruction.

The quality of instructors is always important, but becomes even more important when the instructors have to compensate for the lack of student experience, and need to accelerate the imparting of wisdom and realistic lessons. A great deal of the potential for change rests on training strategies. Therefore instructor preparation and quality will become a critical issue as the agencies move to make training more realistic through the use of Training-in-Context, On-the-Job Training, simulations, exercises, and other advanced techniques. Successfully preparing people to train others competently and effectively represents a paramount issue if the agencies hope to accomplish real change. (See also discussions in Goals 11, 64, 69, and 71.)

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Improving the realism of training is discussed further under Goals 74 and 75, which address decision-making under stress.

Goal 67. Provide an adequate level of training to seasonals.

Implementation Strategy 1 – Analyze seasonals training needs (quantity as well as content).

The agencies should provide a standardized approach to training seasonal and "term appointment" employees by factoring them into workforce needs analyses, and developing the seasonal curriculum based on those needs. To accomplish this, the agencies must identify the skills required, match existing courses and skills where possible, and modify or develop courses where necessary. They then must determine the number and hours of training courses needed to provide training for the desired number of seasonals.

Implementation Strategy 2 – Improve content and consistency of refresher training.

There is currently a widely varied approach to initial and refresher training requirements. The agencies need to assure a more consistent approach that addresses critical skills. For example, 32-hour *initial* training requirements are currently in place as part of the NWCG performance-based training system, and are mandatory prior to fire assignment. However, implementation methods vary widely, and so does the resulting quality and consistency.

The NWCG in May 1997 adopted the recommendation of its Safety and Health Working Team (SHWT) to require annual safety *refresher* training. The adopted recommendation appears to leave much to local interpretation. We recommend that the agencies develop a mandatory 8 to 12 hour refresher curriculum that incorporates the following, at a minimum:

- Hands-on shelter inspection and shelter deployment under realistic conditions (adopt SHWT recommendation to use "Beyond the Basics," 1996, NFES 2179)
- Look Up, Look Down, Look Around ("Look3")
- Standards for Survival and/or Firefighter Survival

Agencies should expand beyond the mandatory 8-12 hour curriculum to include pertinent local safety issues and discussions as suggested in the SHWT recommendation.

In addition to the most critical safety-related skills, refresher training should focus on skills and concepts that degrade the fastest over time when not used. Some research is needed to

identify just which skills and ideas those are. Refresher training also needs to include information on new threats and issues (e.g., the first drought after several years).

The Alaska Fire Service (AFS) of the Bureau of Land Management (BLM) employs a novel approach to refresher training that warrants consideration by all the agencies. It starts with what they call the "2 x 4" approach, two sets of four topics:

- Lookouts, Communication, Escape Routes, and Safety Zones (LCES)
- Fuels, Weather, Topography, and Fire Behavior (as presented in "Look Up, Look Down, Look Around" or "Look3")

In addition to this, the AFS refresher training adds 8 hours of:

- Fire Safety Guidelines (a risk management approach including situational awareness, risk management, risk controls, decision-making, and evaluation)
- Fire Shelter Training (emphasizing avoidance and escape and then fire shelter deployment)
- Fatality and near-miss reviews

The most novel aspect of the BLM/AFS refresher training is that it is developed, revised, and presented by firefighters. The near miss and accident reviews are developed by the firefighters who were involved.

Implementation Strategy 3 – Lengthen "pre-season" for at least first time seasonals and certain specialties.

The 1,039-hour employment ceiling is a barrier to providing time for adequate pre-season training. It has been suggested that the agencies lengthen seasonal employment terms on the front-end (pre-season). An extension of one to two weeks has been suggested by some. The add-on (and its length) should be based on bona fide training needs. It will increase costs but is critical to safety. The refresher training for some specialties (e.g. supervisors, engine bosses, initial attack incident commanders) needs more than the minimum 8-12 hours allocated for a crew person's training, and is another reason for extending the season. It would be desirable to extend the "pre-season" for all, but to make it more cost-effective it can be extended more selectively.

Implementation Strategy 4 – Provide more off-season training for seasonals.

The agencies have authority to pay temporary seasonal employees and non-employees (EFFs) a "day rate" for attending training during the off-season for up to 80 hours of training a year, at the AD-1 level. Paying for training not only makes it more palatable, but adds to a person's sense of commitment to return, and adds to their perception that the agencies care about them and regard them as professionals, with a long-term mutual commitment.

Implementation Strategy 5 – Include in the Red Card system seasonals with ICT 5 or higher level certification.

It currently is hard to know when a seasonal can be scheduled for higher level training. The agencies have a significant investment in the training and experience of their seasonal and term employees. They should protect that investment by including in the Red Card system seasonal and term employees who are qualified at or beyond ICT5 and should track their training thereafter. The agencies should do so consistently across all agencies, providing training plans for seasonal and term employees linked to the workforce needs analyses of each agency as discussed in the previous goal. These training plans could be less formal and not developed to the same level as for permanent, full-time employees.

Implementation Strategy 6 – Revisit Smokejumpers and Hotshot refresher training with respect to safety.

Hotshots require a 24-hour refresher each year. Smokejumpers receive 40-80 hours of refresher training depending on their agency and base. It is unclear whether this 40-80 hours includes in all cases firefighting and safety refresher training (as opposed to jump qualification re-certification). The agencies should review the Hotshot and Smokejumper refresher training nationally regarding the approach to firefighter safety taken in those curricula.

Implementation Strategy 7 – Take advantage of down-time for training.

In some seasons there is much down-time that could be used for either on-the-job training or more formal training modules or courses. This is standard procedure for volunteer and career local fire departments, and should be used to enhance skills and safety of seasonals. It is recommended in addition to training at the beginning of the season.

Implementation Strategy 8 –Provide incentives for seasonals to return.

Retention of seasonals would "save" training given in prior seasons. That should be a factor in considering compensation and promotion practices.

Goal 68. Develop training priorities to make the most efficient use of the limited training resources.

Implementation Strategy 1 – Use overall training needs analysis to set priorities.

The survey and interviews in Phase I expressed more concern about the adequacy of training for FMOs and Crew Supervisors than other positions, followed by Division Supervisors and Agency Administrators. However, upon reflection and with more recent information on the interagency task group on competencies, we do not agree with that approach to set priorities for training. The agencies should not set arbitrary "priorities" for training based on the importance of a position, but rather should allocate the training resources needed to achieve the competencies for each position, with an allocation of training resources based on an interagency needs analysis, as outlined in the implementation strategies for Goals 42, 43, and 64. That is, rather than giving priority to training Crew Supervisors or FMOs, one should determine the number needed at each position in the hierarchy versus the numbers available and certified. It may well turn out that the positions that most need the training resources are Crew Supervisors and Division Supervisors, but it could turn out that Engine Captains or bulldozer operators or others were more critical.

Implementation Strategy 2 – Target certain individuals.

When training slots are limited, give priority to training those who will take fire assignments, and who will be made available by their organization, if known. Some people take advanced training to build resumes and certifications with no intent or opportunity to use them. That can be harmful to safety if they preclude someone who is active from getting trained.

One should also consider the competency level (versus the required competencies) of the individual person (FMO, Crew Supervisor, etc.) in setting priorities.

A current initiative with potential to do just this is the "allocation of resources" ("draw down") concept being worked on by Buck Latapie of the Forest Service and Lee Englesby of the BLM. Region 6 of the Forest Service, and the BLM in the states of Washington and Oregon already employ this concept. In part, the system identifies in advance of the fire season a list of

individuals by position who agree to be available for fire assignment (and who have no constraints on doing so from their boss, spouse, or others). The assumption is made that if these people go to the training, they will be available for fire assignment, and hence should be given priority for training. The understanding cuts the other way too – if you want to go to training you agree to be available. The agencies should support this effort and expand its use nationally

Goal 69. Provide supervisors with training in leadership and supervisory skills.

As discussed in Chapter 4 on leadership, there is a need to add training on leadership and human relations to the technical side of leadership training.

Implementation Strategy 1 –Train supervisors, IMT members, Floss, and dispatchers in key "human" skills.

Train all supervisors, IMT members, Floss, and dispatchers in communication skills, and how to interact effectively and with trust. The intent should be to improve effectiveness of communication, conflict resolution, and assertiveness at the operational level. This training should be mandatory for Squad Bosses, Crew Supervisors, Strike Team/Task Force Leaders, Division Supervisors, Operation Section Chiefs and ICs. To accomplish this the agencies need to re-examine what skills a fireline leader needs (see below) and train people in those skills. Courses should employ simulations under stress and realistic conditions.

Just training leaders to think about safety at fires may be less effective than using a more comprehensive approach which changes the process and attitude of how people do their day-to-day job, not just their fire job.[21] Therefore, the agencies preferably should provide supervisory and leadership training to all fire management personnel who are in supervisory and management positions in their day-to-day assignments, to get people in a safety mind-set all the time.

Some would suggest that the intent of this goal will be met through new courses S-201 (Supervisory Concepts and Techniques) and S-301 (Leadership and Organizational Development). However, these are primarily fire suppression skills courses. For example, S-201 is intended as a course to prepare *first level supervisors on a fireline incident.* S-301 is designed to train an individual in mid-supervisory and leadership skills at the unit leader level.

[21] Patrick Withen, "Beyond Crews: Firefighting and Work Teams," Wildfire, March 1997.

These are well-developed courses and provide a good foundation for overall supervisory and leadership roles. We recommend building on this foundation by adding or expanding several topics and including some changes:

S-201

- S-201 presents an effective approach to the essentials of supervision, particularly in the areas of conduct, ethics, and workforce diversity. Decision-making, communication, and leadership skill areas are addressed, but should be part of a more comprehensive, connected set of skills that also includes situational awareness, mission analysis, adaptability, and assertiveness.

- The S-201 course also can be the first opportunity to introduce characteristics of "high reliability organizations," including accountability and responsibility, adaptiveness and responsiveness, openness and cooperation, hazard awareness, inquisitiveness and search for detail, role clarity and maturity.

- S-201 also needs to focus on decision-making concepts such as "recognition-primed decision-making" and "naturalistic decision-making methods" versus the traditional or rationalistic model used in the course at present. (These decision-making concepts were discussed in the Phase I and II reports.) Training in decision-making will be addressed further in the discussion of Goal 74, preparing leaders for decision-making under stress.

- The course's treatment of motivation is external in focus and needs to address why people do what they do and why they do or do not follow their supervisor.

- The course's approach to what it calls "Situation Leadership" and "Situational Style Theory" needs to reflect the state of the art in the application of the Situational Leadership model, and apply critical concepts of that model (currently lacking) in application exercises.[22]

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[22] Situational leadership is an increasingly influential leadership program which is being widely accepted as a managerial philosophy throughout the world. Managers in more than 1,000 of the world's leading organizations use Situational Leadership principles. The Situational Leadership model provides a tool for supervisors and managers to assess their employees' ability and respond effectively. The training materials need to be adapted and redeveloped specifically to the fire community. See Paul Hersey, The Situational Leader, Center for Leadership Studies, Escondido, California, 1984.

S-301

S-301 also appears to be a well-developed course, particularly in the areas of communication theory, power, delegation, conflict resolution, and objectives. The Pre-course Work (what the student does prior to attending the course) includes good information on performance management and coaching/mentoring. The course materials include well thought-out application exercises. However, to achieve the Goals and the Implementation Strategies outlined here, the following modifications are recommended:

- The Pre-Course Work and the Communications Unit should introduce the communication techniques associated with Crew Resource Management (CRM.) These techniques are discussed under Goal 81.
- The unit on leadership provides an effective introduction to leadership and supervision, but requires work to present critical concepts in a more comprehensive fashion. The leadership unit should be critically reviewed by Human Resource Development professionals. Some specific areas of concern viewed by our team are addressed below.
- The course uses the Blake and Mouton's Managerial Grid as a leadership model. Sometimes the Managerial Grid gets taught as if there is one best style of leadership (what the Managerial Grid calls "Team 9.9"). Other S-201 course materials advocate recognition of differing developmental levels and Situational Leadership. The Team 9.9 style of leadership may not always be appropriate for some fireline situations and could counter the essential skill of "adaptability" associated with CRM. The course should not leave the student with the idea that "9.9" is always the best leadership style.[23]
- The inclusion of Situational Leadership concepts in the course is good but would be better if the course kept closer to the original model as designed by Hersey and Blanchard. The discussion of Situational Leadership should be critically reviewed. This will provide an excellent foundation for additional Situational Leadership study in the curricula.
- A unit on decision-making should be added to this course. It should focus on recognition-primed decisions (RPD) and other "naturalistic" models and provide

[23] At least one senior instructor said the course is not taught that way, so in practice the issue may be minor.

opportunities for trainees to apply and exercise those skills. (See Goals 74, and 75, and 82.)

- A unit which applies some of the concepts of High Reliability Organizations to the responsibilities should be added to this course.
- The course already makes extensive use of self-evaluation instruments. Several are appropriate for determining leadership styles for incident management. We recommend that the relatively new and very effective contemporary tool of "360° Feedback" be considered for this course. This approach would help address the issues of personal suitability for fireline qualifications and fire management positions, which were raised during this study.

S-201 and S-301 already provide leadership and supervisory training that is a quantum leap beyond what was previously available. With the changes above, S-201 and S-301 should be made required training. The agencies should incorporate S-201 and S-301 into a comprehensive approach to leadership and supervision training that builds on and supplements these foundation courses. The comprehensive approach should provide state-of-the-art (contemporary) leadership training at all levels of the suppression and fire management organizations, and include the following topics for various positions:

Firefighters: one hour of "followership" as a stand-alone module on:

- Interaction
- Listening skills (listening and learning)
- Receiving, interpreting, and following instructions
- Teamwork
- Good followership (attitude, cooperation, influence, leadership, initiative, work ethic)
- Making decisions together
- Watching out for one another

Advanced Firefighter/Squad Boss/Incident Commander Type 5. S-201, with the changes recommended above, plus a stand-alone course or stand-alone modules on:

- Giving instructions/influencing behavior
- Dividing up the labor

- An introduction to motivation (why people do things) and power (why people follow your lead)
- Common mistakes of new supervisors and supervising former peers

Crew Supervisor/Single Resource Boss/Incident Commander Type 4. An additional 8 hours beyond the above two modules, including a stand-alone course or stand-alone modules on:

- Assigning work/employing the talents of the crew
- Connecting their crew to outside world/teamwork
- Respectful interaction with crew members and Incident Management Team
- Role of Crew Supervisor as teacher/role model/mentor (build on information from Squad Boss course)
- Making decisions together (build on information from firefighter course)
- Motivation and power (build on information from Squad Boss course)
- Influencing behavior (build on information from Squad Boss course)

Incident Commander Type 3. S-301, with the changes as recommended above, plus a stand-alone course or stand-alone modules on:

- The Command function/role
- Assigning work/recognizing capabilities and deploying resources
- Interaction (respectful) with assigned resources
- Influencing Behavior (building on information from S-301)

Some safety experts suggested that separate leadership modules are needed for helitack foreman, engine captain, and possibly other specialized positions.[24]

To reiterate, the leadership and supervision training discussed above should be developed or at least reviewed by HRD professionals. The added training in human relations should be

[24] The above comments apply through the 300-level series. We did not review the 400-level and 500-level courses because there were few negative comments about the courses at the top of the hierarchy, including personnel surveyed who were at those levels. An assessment is needed of whether those highest level courses need more human relations content.

conducted by fire people with strong HRD backgrounds (or talents) and who are further developed as trainers.

Goal 70. Teach wildland firefighters the basics on hazards faced in the urban/wildland interface.

Implementation Strategy 1 – Train on the interface hazards to expect, and how to deal with them.

Phase I of this study indicated that wildland firefighters are increasingly finding themselves fighting fires in the wildland/urban interface zone, and they are deeply concerned about their safety there. These situations are likely to become more common because of continued development in rural areas. Despite policy to leave structural firefighting to state and local agencies (except within the national park system), Federal wildland firefighters will at times face fires in interface settings. They must be prepared, within the constraints of Federal policy.

Wildland firefighters need to know about hazards such as propane tanks hidden by tall grass or bushes outside of structures, hidden electrical wires, and other hazards if they are to protect structures externally. And if the cultural reality is truly faced, one will find that Federal firefighters in some cases will join with local firefighters to save homes. Citizens expect all firefighters to fight all types of fires. If wildland firefighters ever have to fight structure fires or fires near structures, they need to know the basic procedures and hazards – or be instructed to not fight fires inside structures, and be strongly backed when they do not do so, in accordance with policy.

Wildland firefighters may even need to know some basics on EMS: BLM firefighters have had people drive up to their fire house bleeding or about to have a baby, because they assume all fire houses provide EMS.

The fire suppression curriculum currently contains a course (S-205) intended to cross-train urban and wildland firefighters, and it seems to be doing the job rather well. The National Fire Academy and the National Wildfire Coordinating Group are currently funded and tasked to analyze, and on approval, redevelop S-205 (Fire Operations in the Interface). There is a possibility that the existing course may be redeveloped into multiple courses. This initiative should be completed, and the resulting training implemented widely at the earliest possible date.

On-the-Job Training

An extremely promising way to pass on know-how from experienced firefighters and fire managers is by improving their skills in on-the-job training.

In most workplaces, On-the-Job Training (OJT) is the primary way that people learn what they need to do their jobs well. Classroom training often lacks realism and does not completely transfer into the field. Also, classroom training practices contradict much of what we know about adult learning, such as that adult trainees need to see immediate relevance, to be actively engaged in exploring, and to be self-motivated. Classroom training often disengages the learner from the job context, makes the learner passive, imposes the instructor's mental model, and substitutes the instructor's motivational skills for the trainees' own.

Organizations sometimes produce procedural manuals or checklists of training tasks to be taught to new trainers, but few help OJT providers develop the specific skills to deliver effective OJT – how to coach people in the field. In fact, few people even think that there are skills that can be taught on how to do on-the-job training, or mentoring. Such skills include the following:[25]

- How and when to pass on expertise
- How to identify the teachable moments in a day (versus forcing a topic on a day with no appropriate examples)
- How to be a manager of someone else's learning
- How and when to use a variety of instructional techniques
- How to diagnose the reason why a trainee "just isn't getting it"
- How to set reasonable learning goals
- How to re-adjust these learning goals so that the trainee is neither bored nor intimidated
- How to notice and change a poor learning climate

For example, one can ask firefighters how they would go from point A to point B before their crew supervisor says how he or she intends to do it, and then discuss the pros and cons of

[25] A total of 57 skills for tracking OJT providers have been identified and are included in Appendix B, which expands our discussion of On-the-Job Training.

the options. This often can be done rapidly and can be invaluable to the learning process. It gets people thinking, and accelerates their learning

On-the-job training offers not only the potential to capture some of the expertise now in the agencies before it is lost and to speed up the gaining of experience by the current generation but also may help retain expertise by offering a rewarding mentor role to the old "warhorses" and encourage them to stay longer to pass on their expertise. OJT provides a variety of other secondary benefits, too. For example, it also helps make firefighting more professional: passing on learning is a hallmark of being a professional. Also, by establishing a new mechanism for sharing expertise, the agencies send a message that they expect their personnel to achieve high levels of competence.

We are confident of the benefits of an OJT program for wildland firefighting because of the success of the program in the Los Angeles County Fire Department, and the enthusiasm of the U.S. Marines in starting their own OJT program. The Los Angeles County Fire Department is in the process of institutionalizing an OJT program for its captains after the positive results of a pilot program. The Department took the OJT training over from its developers and are putting on their own workshops. The Department is planning to ensure that in the future, all captains become skilled in providing OJT.

For all of the above reasons we believe that instituting OJT training (Goal 71) is one of the most important, pertinent, and novel goals in this culture study.

Goal 71. Maintain skills and safety awareness with on-the-job (and refresher) training. (Also accelerate the build-up of experience.)

The need for improving refresher training has already been covered in previous goals (e.g., Goal 67). The implementation strategy below addresses how to implement on-the-job training. Appendix B provides a fuller discussion.

Implementation Strategy 1 – Develop a formal OJT training program, including teaching supervisors how best to provide OJT.

The agencies should implement a formal OJT program that goes beyond the current OJT component of the performance-based training system. A formal OJT program would use field opportunities to build the skills of personnel at all levels of the organization. Safety can be

improved through gaining expertise, and an effective OJT program can be a vital means of ensuring that expertise is enhanced where it counts the most: in the field.

The OJT approach we recommend for building expertise consists of three primary components: climate-setting for the student, assessment/diagnosis of the student's progress, and instructional methods. These content issues are discussed in Appendix B; below we discuss the overall steps for establishing a program.

The concept of an institutionalized OJT program seems like a major step, and it is. However, we suspect that the agencies are unlikely to make large gains in safety and in building expertise without taking major steps. The logistics and impact of an OJT program are probably even more cost-effective than the investments previously suggested for simulation and multimedia training systems.

The basic tasks to establish an OJT program are as follows:

Set Objectives – The first step in setting up an OJT program is identifying its educational objectives. Among the most important topics to address with OJT are being able to:

- Achieve situational awareness
- Detect when situations have shifted
- Anticipate how situations can or are likely to develop
- Make judgments about what is typical versus what is an anomaly
- Make decisions under time pressure and various degrees of uncertainty
- Make subtle perceptual discriminations
- Spot problems very early
- Identify leverage points for overcoming problems
- Use various "tricks of the trade"
- Improvise on the spot

These are key aspects of wisdom and know-how that are difficult to teach in the classroom by traditional methods. There may be many others to add to the list.

OJT can also be used to support skill development for procedural tasks. However, to build a culture of safety the agencies should not simply teach crews how to carry out tasks,

follow rules and procedures, and operate equipment but also how to detect when safety margins are being violated. To do this, an OJT program must develop people's perceptual skills.

Establish targets by position –After setting educational objectives, we suggest that, while OJT can be used at every level, for almost all skills, the primary positions targeted for training in how to conduct OJT would be first line supervisors, including Squad Bosses, Crew Supervisors, and other Single Resource Bosses. These people are in the best position to boost expertise of crews and other fire personnel on a massive scale for a minimal investment.

The secondary targets would be assistant fire management officers, Strike Team Leaders, Task Force Leaders, and Division/Group Supervisors. They would benefit by understanding what the first line supervisors were to do with OJT and could themselves use training in how to provide OJT to help boost the skills of the front line supervisors.

A third target could be firefighters, who would benefit from an OJT orientation program about how to ask questions and how to come up to speed more quickly, particularly in making sense of issues that affected their own safety. They will be more willing to learn if they understand OJT is intended to work.

Develop the instructional materials and framework – The starting point for the program could be either a four-hour course prepared for Crew Supervisors and other first line supervisors, or a module added to existing courses. They need to be given not just the general idea and skills to practice, but to experience themselves how it feels to give and receive effective versus ineffective OJT. This must not be a one-shot course that would be quickly forgotten. Some provision needs to be made to have a series of follow-up sessions to reinforce the use of OJT practices. The follow-ups can be group sessions to discuss progress, add additional strategies to the instructional repertoires, and trade lessons learned in delivering OJT. The OJT training requires direct interaction and practice, and is most effective when taught to groups of 8-12 people at a time. In the interests of practicality, it would be wise to start with a pilot program for 6-12 months, make any course corrections necessary, and then institutionalize the training.

Derive assessment procedures –It is critical to assess how well individuals are conducting OJT. Assessment procedures need to be designed, for example, so that Division Supervisors can determine whether a Crew Supervisor is making effective use of the OJT techniques, is skilled at transmitting his/her own expertise to others, is helping the senior crew members to explain things to the new members, and is establishing a climate that fosters learning

rather than a climate of intimidation that discourages learning. Without a systematic effort to conduct assessments, the OJT program will gradually diminish and disappear, and the initial investment will be lost.

Prepare the organizational support – Too often, programs such as this are initiated with high levels of enthusiasm and expectation, as if good ideas by themselves will prevail. However, the reality of organizational dynamics is that it requires incentives and attention to maintain momentum. It may take the agencies as much as 5-10 years to fully institutionalize a wide-scale OJT program. "Fully institutionalized" means that a new generation of Crew Supervisors will be inducted into an organization that relies on OJT and expects that each Crew Supervisor is competent to provide OJT to the crews in his/her care.

A critical element of organizational support for the OJT program is to certify fire program personnel and Incident Management Teams, including squad leaders, single resource bosses, and division supervisors, as being competent to provide OJT, and to make the demonstration of such competence a requirement for promotion. This is yet another requirement, but the alternative – accepting people in positions of responsibility who are unable to facilitate learning about issues related to safety – seems less acceptable. If we expect that Crew and Division Supervisors are able to provide effective training, then that carries with it the responsibility to ensure that they have the skills necessary to carry out the responsibility. However, it is unreasonable to impose a requirement for OJT certification before there are ample opportunities to receive the training program and to practice the OJT skills. Therefore, the OJT program would have to be established on an informal basis first, followed by the certification requirement after several years, with adequate warning and announcement so that no one was surprised or disadvantaged.

The development of a corps of competent OJT trainers can and should be accomplished in concert with the apprenticeship program described in the implementation strategies for Goal 11, and with the promotion of professionalism (Goal 59). The cadre of the apprenticeship program would be given priority in acquiring OJT skills. The participants of such a program would form the professional core of agency fire programs.

OJT is cheaper and more effective than classroom training for many skills. Once established, the OJT program can serve as a platform for training in the future. In that way, it is a "force multiplier" for the agency fire programs. As noted earlier, a more comprehensive

discussion of OJT principles, the application of OJT in the fire programs of the five participating agencies, and implementation approaches are to be found in Appendix B.

Individual Action in Emergencies

Firefighters need to understand the necessity to switch modes of action when they are in life threatening situations. Repeatedly we were told of situations where the realization that "something had changed" was delayed. Statements like "I didn't realize we were truly in a bad situation until the squad boss shook out his fire shelter," indicates a real need to improve communications about extreme emergencies. There also is a need for firefighters to recognize when it is time to back out, and when dropping their tools and fleeing at maximum speed makes sense.

The change in behavior or culture needed here requires a new lexicon for bail out situations. Some clear instruction or trigger phrase is needed for "drop your tools and run," versus "move rapidly to a safety zone." Firefighters must be clear whether they are to take tools with them (e.g. so that they may clear a space to deploy their fire shelter) or not to take tools with them (so as to move faster). The goal is for the Crew Supervisor to elicit a timely and appropriate response, and to get firefighters to follow the instructions and act together with their team. For this to occur, firefighters must be prepared to change their mental set in emergency situations, and recognize that one is no longer fighting the fire but rather saving one's life.

The bulk of training recommendations throughout this report are intended to help crews avoid getting into emergency situations. But sometimes the unavoidable happens. Training is needed for facing dire emergencies at both the individual firefighter level and crew level. It is necessary to explicitly train crews on how to react to emergencies not only so they know what to do but also so that they can easily switch modes in an emergency, and remember that what might be inappropriate to do in normal circumstances (such as dropping tools) may be absolutely necessary in extraordinary circumstances.

Goal 72. Provide training to crews on the reaction skills needed in dire emergencies that endanger them.

Goal 73 – Instill in each firefighter the necessity to switch modes and take extraordinary action in extraordinary emergency situations.

Implementation Strategy 1 – Train on emergency skills at the individual level.

In addition to realistic training on the selection of safety zones and deployment of shelters, individual firefighters must be instructed that in extreme situations they may be ordered to drop everything and run for it. Because there are tragic examples of firefighters injuring themselves with tools while running, they may need to be given drills in activities such as dropping tools and running, to be remembered on the rare occasion when needed. This would be made only after a decision not to walk out carrying tools – when there literally is no time left. There are many examples from other fields that show that people often fall back to usual, familiar skills instead of switching to emergency skills in an emergency. A classic example was a police officer killed in a gun battle who had stopped to collect the valuable spent shell brass casings while reloading because he had formed a habit of doing so in training on the range, even though it slowed him down.

Implementation Strategy 2 – Train on communicating in emergencies.

The agencies must train people on crew communications under highly stressful, emergency conditions. Previously we discussed using respectful interaction, following instructions, and preventing loss of crew cohesion/structure. The intent was to create the ability for firefighters to voice concerns and point out changing conditions in a condensed, respectful manner. But in more extreme situations, when threatened by being overrun, there may need to use stock phrases and instructions that trigger emergency actions that need to be obeyed immediately such as "deploy shelters now," "drop tools and run," or "follow me." This training should include terse emergency signals sent up the chain of command that alert people to an extreme emergency situation. (Communications protocols already include the ability to call for priority use of a channel for an emergency message.) This all needs to be done without losing crew cohesion.

The "emergency vocabulary" should be consistent with the common fireline vocabulary. The previously mentioned Human Factors Workshop participants recommended a consistent vocabulary system for use by Incident Commanders, FMOs, and dispatchers. They frequently mentioned the Campbell Prediction System for this purpose. Whatever vocabulary is used has to describe existing conditions so that everyone understand them and responds appropriately. The vocabulary should enable firefighters to describe fire behavior, conditions, common dangers (snags, rocks, proximity of other crews and equipment, etc.), interface conditions, and escape

urgency (abandoning the line, exercising escape routes, deploying shelters) using standard, understandable terminology.

The agencies should evaluate the Campbell Prediction System, S-290 and Look3, then choose the most appropriate vocabulary, or develop a hybrid, and then teach and use that vocabulary in the training system. The National Fire Protection Association is reportedly working on a standard vocabulary which may influence this strategy; the agencies should stay abreast of this effort.

Implementation Strategy 3 – Emphasize "stress-resistant" training.

The desired outcome is to produce firefighters who automatically, instinctively, and "stress resistantly" shift gears from fighting the fire to saving their lives. This instinctiveness will result from "Stress Resistant Training" such as OJT and "Training In Context," which have been recommended under earlier goals. The concept of Training In Context emphasizes that under stress, you will perform as you learned. Based on that premise, the training environment should recreate the context and content of the operating environment (as discussed under Goal 66 on making training more realistic).

Decision-making Under Stress

A key area in which training must be improved is decision-making under stress. This is important enough to merit its own section here.

Stress can be psychological or physical, and represents a significant barrier to individual functioning in the wildland fire environment. Firefighters most commonly recognize stress as information overload, task saturation, exhaustion, or fatigue. Although stress responses, particularly physical ones, are generally predictable, mental stress is very much an individual phenomenon. One firefighter's response to mental stress may be to concentrate on one thing at a time, while another firefighter's response might be to talk incessantly. These individual responses can cause serious communication and cohesion problems within a crew, team, or other unit.

Stress responses and individual means of coping also impact decision-making ability. The ability to make decisions under stress may be <u>the</u> single most important skill needed to improve firefighter safety. It is arguably the most important human factors change needed in the

organizational culture. Firefighters generally keep themselves out of harm's way by making good decisions and by responding appropriately when faced with unexpected fire behavior, the risk of being overrun by a fire, or other challenges to their safety. However, many investigations of firefighter fatalities show that poor decisions made under stress contributed to the incident. These considerations led to Goals 74 and 75, which focus on training people to operate under stress, and ways to reduce the stress.

Goal 74. Prepare leaders for decision-making under stress.

Goal 75. Prepare the entire workforce [not just leadership] for working under conditions of stress.

Implementation Strategy 1 –Develop a Decision Skills Training program.

The agencies should implement an expertise-centered approach to decision training. An excellent version of this is the "Decision Skills Training" program, which consists of seven tools designed to improve decision-making under time pressure and uncertainty by facilitating the growth of expertise. The tools are:

- Decision requirements
- Tactical decision games
- Decision critique
- Pre-mortem exercise
- Uncertainty management
- Commander's intent exercise
- Situation awareness calibration

These seven tools or exercises are described in Appendix C.

The Decision Skills Training (DST) is aimed specifically at developing the ability to size up situations, determine feasible reactions, manage uncertainty, detect the early signs of problems, clearly communicate assessments of situations, and calibrate the team's understanding of the situation.

The training includes exercises to accumulate a set of experiences and opportunities to make decisions under time pressure and uncertainty. The Decisions Skills Training should be integrated into both tactical and leadership training.

The value of a Decision Skills Training program for the Federal fire community is to produce squad leaders, Crew Supervisors, strike team/task force leaders and division supervisors who can read shifting conditions, anticipate future developments, spot early signs of problems, manage uncertainty, and communicate their intentions.

The training decision should produce "hardened" decision-makers who are prepared to make tough calls such as decisions to avoid or withdraw from risky situations despite organizational pressures to stay the course.

The DST program would complement the On-the-Job Training program described under Goal 71. Both approaches are geared towards expanding expertise and accelerating acquisition of experience.

Once an OJT platform is created, it can easily be used to provide training in decision-making. Similarly, an organization that wishes to begin with a Decision Skills Training program will find it easier to build on it to establish an OJT program.

This strategy should be implemented in concert with the implementation strategies listed under Goal 4, which advocates the establishment of a "lessons learned" capability that is important background for decision-making.

One of the encouraging findings from the research on training people for decision-making under stress is that practicing for almost any type of stress seems to help people cope with a wider variety of stresses. The agencies should reinforce learning and exercise the decision-making skills learned in the Decision Skills Training throughout the curriculum. See Appendix C for a further discussion of developing a DST program.

Implementation Strategy 2 – Increase emphasis on "naturalistic" and "recognition-primed" decision-making.

Naturalistic Decision-making and Recognition-Primed Decision-making (RPD) are terms for how people use their past experience to make decisions, and how they must be aware of

cognitive limitations and traps that humans easily get into. These research subjects were discussed in an Appendix in the Phase I report.[26]

Wildland firefighting requires decision-making in time-critical situations. The majority of these decisions will be "recognition-primed," i.e. based on recognizing situations. Recognition-primed decision-making relies upon accurate assessments of the situation(s), which means the decision-maker has to have previous experience to use to help establish goals, expectations, recognize critical cues, and identify and evaluate potential courses of action.

The agencies should revise the decision-making content of course S-201 (Supervisory Concepts and Techniques) to focus on "naturalistic" and "recognition-primed" decision-making in addition to the more traditional approaches to decision-making contained there. The traditional rational decision-making model presented in S-201, which includes weighing of alternatives, would be useful for decisions when people are trying to select the tactics to best implement a strategy. However, on the fireline, firefighters rarely have time to generate options, establish criteria, and rate each option. Naturalistic decision-making models deal with decisions made under stress with minimal response time – making sense of the situation and taking rapid action to mitigate problems. Recognition-primed decision-making (RPD) is such a naturalistic model. According to the findings of the Human Factors Workshop, firefighters need training on various types of decision-making, and guidelines that help determine when each model is best.

The RPD model explains how experienced decision-makers can generate a reasonable course of action without having to compare or contrast it to alternatives. At its simplest level, decision-makers using an RPD approach experience a situation and match it to a typical situation which they have already experienced. Experience enables them to size up a situation, understand what is going on, and react appropriately. Klein's research shows that firefighters rely primarily on RPD strategies. The agencies should focus on incorporating opportunities to exercise naturalistic decision-making through highly realistic and interactive exercises. Use simulations and role plays as appropriate.

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[26] For more information on naturalistic decision-making in the wildland fire environment, please see Gary Klein, 1995, Naturalistic Decision-making and Wildland Firefighting, presented at the U.S. Forest Service Human Factors Workshop, June 12, 1995. This paper is included in Findings From the Human Factors Workshop, 5100 F&AM, Forest Service, November 1995, 9551-2855-MTDC (updated July 1996).

Implementation Strategy 3 – Search for ways to reduce workload and stresses in the field.

Processes, tactics, and techniques for reducing workload and other stressors in operations should be included as a part of operational training. "Tricks of the trade" should be collected from experienced personnel working specific operations, and shared or incorporated into formal training, not as "stress training" but as part of routine operational training courses.

This might include: learning to draw on a crew's collective memory, wisdom, and logic (following the findings of Putnam and Weick), thereby spreading out the perceived burden of decision-making; respectful interaction; meditation (or simply taking breaks to regroup and clear the mind); reducing the number of Watch Outs and orders to remember; managing information overload; and providing adequate, timely information (thus reducing worry about the unknown). All of these have potential for reducing stress and improving decisions.

Implementation Strategy 4 – Encourage self-development of ways to cope with stress.

Crew members need to examine their own stress symptoms in the context of decision-making and safety. As will be discussed further under Goal 81, crew resource management (CRM)-type training can help crew members to understand the problems that stress could cause for themselves and their crews. It can also assist them to develop individual strategies for coping with the situations they personally find stressful, which varies from person to person. For example, as overload represents the high end of the stress spectrum to some, complacency, boredom, and monotony can mean high stress for others. When mopping up for two days, people may drop their guard and not be ready for a flare-up, or not stop to periodically check for dangers such as falling snags.

As problems resulting from individual stress reactions are combined, the collective crew function can suffer greatly, sometimes falling to the lowest common denominator. Crew members and leaders should be trained to understand the effects of common stress reactions in fellow crew members and to find methods for counteracting the effect on the crew and on the leader's decision-making. Again, CRM-type training can assist both crew members and leaders with this effort.

For example, a crew member may recognize a familiar crew situation in the communication section of a CRM workshop. After the participants discuss the issue and work together to come up with possible solutions, the firefighter can develop a personal strategy that will assist him/her to prevent or mitigate the error if/when it occurs again. This process applies

to any CRM concept, such as cohesion/coordination, communication, or decision-making. It also can be applied to barriers such as fatigue, stress, boredom, or complacency. The personal outcomes of CRM vary from person to person, because the development and application of the personal strategies are geared for each participant's needs.

Implementation Strategy 5 – Develop a 'catalog' of visual indicators or cues of situational change.

As part of recognition-primed decisions, one needs help with the "recognition" of different situations. The key point is learning to recognize different kinds of real world cues or indicators of situational change, such as the appearance of cumulus clouds, a drop in humidity, and or apparent shift in the direction the fire is moving.

To make tactical decisions under stress the individuals must be trained and/or experienced in being able to recognize and assess what is actually taking place (situation assessment). This involves training the individuals to first make the initial determination of "what's going on here."

The individual then can draw on previous experiences to help determine what to do, what to watch out for (critical cues and expectancies), what goals to set, etc. For this to be effective, the individual obviously needs a knowledge base of experiences to draw upon. Ideally these are from their own experiences, but some can be learned through training, case studies, video, simulations; and stories.

Decision-makers must be trained to deal with uncertainty. Uncertainty is the norm, not the exception. Individuals can become frozen because they are unable to deal with the degree of uncertainty. Training people to deal with uncertainty includes: understanding what constitutes uncertainty (missing, incomplete, inaccurate, and/or misleading data); recognizing where the uncertainty exists; recognizing where additional information may be able to be acquired to reduce some of the uncertainty (as well as recognizing where it can't); and being able to make the judgment "Which is more valuable to me, the reduction in uncertainty this will buy me, or the time I will use up in the process of trying to reduce the uncertainty?"

Time constraints are usually imposing in naturalistic decision-making. The end result is that decision optimization is usually not a realistic goal. What is more realistic is to identify the option that will "do the job" regardless of whether it is optimal and then get on with it. The central factor in naturalistic decision-making with great uncertainty is not looking for exact

replications of situations experienced before. Rather, it is looking for indicators of change experienced before. These are cues that alert the firefighter that the situation is changing. Some people are able to do this and some can't. Those that can do well with naturalistic decision-making; those who can't will be poor field leaders/supervisors.

Therefore, as part of the effort to improve decision-making, the agencies should embark on a project to catalog "visual indicators" needed to build scenarios for teaching and develop simulations. This can be accomplished by interviewing the most experienced fire people to determine images with which to build the catalog. The agencies should evaluate S-290; Look Up, Look Down, Look Around; and the Campbell Prediction System in light of their emphasis on visual indicators of fire behavior, and develop the most effective method for transferring this knowledge about visual indicators to fire personnel.[27]

Implementation Strategy 6 –Talk about stresses and raise awareness.

Simply letting firefighters know the kinds of stresses to expect, and talking about them, is helpful. Firefighters need to be warned to expect feelings of homesickness after being away from family, friends, and home for two weeks at a time; they may find they have difficulty in concentrating. Open discussion of stress factors often helps a person begin to manage the stress.

Fatigue

Fire personnel interviewed in this study cited fatigue as a serious safety problem. Fatigue affects safety by affecting judgment, reducing alertness and situational awareness, and physiologically making people vulnerable. Exhaustion and dehydration are dangerous in and of themselves.

Rested firefighters are not only more effective, but are safer.

Fatigue in wildland firefighting arises in numerous ways. We heard many examples of Agency Administrators and Incident Management Teams pushing firefighters and fireline Incident Management Teams too hard to avoid a transition from local control to an Incident Management Team, or from a Type II team to a Type I team. These situations can result from a

[27]The agencies might also consider a similar effort to catalog "behavioral indicators" of cohesion and leadership, and other human factors problem, and use that to enhance decision-making training as well.

desire to hold down expense, or avoid a more complex situation, or because of lack of available resources, or simply out of pride. However, fatigue and its severe impacts on firefighting safety can more often be traced to four primary causes.

Causes of Fatigue

First, firefighting personnel often work too many consecutive hours, on too many consecutive days, and often on too many successive fires. Data from a BIA study showed that the majority of injuries occurred among crews during the third week since they had left their home base.[28]

Second, firefighting personnel are not receiving adequate rest while assigned to fire duty. Incident bases are busy, noisy places not conducive to sleeping. Inadequate sleeping facilities represent a particularly severe problem for personnel assigned to night operations who must try to sleep during the day. The effects of chronic sleep deprivation are well known, including effects on mood, cognitive abilities, and motor skills. A recent study found that cognitive abilities suffer more than motor skills, but all decline after sleep loss. Given the strong belief that greater situational awareness is a key to firefighter safety, sleep deprivation may represent a very great impediment to maintaining safe and effective operations, and may represent an even more serious threat to firefighter safety than was perceived by the firefighters interviewed in this study.[29]

Third, firefighting personnel pay too little attention to adequate nutrition and hydration, important factors in reducing fatigue. Nutritional and hydration requirements for firefighters have been well researched by the Forest Service's Technology and Development Program. Its research results and recommendations are documented in a technical report entitled *Fitness and Work Capacity.*[30] It found that energy requirements for firefighters are very high. Failure to replace the energy can lead to rapid weight loss and excessive fatigue. The research findings

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[28] Personal communication, Steve Haglund, Fire Director, BIA, to Philip Schaenman, 1996.

[29] "Effects of Sleep Deprivation on Performance: A Meta-Analysis," Sleep, 1996, (19(4): 318-326. Sleep is the Journal of the American Sleep Disorders Association, the Sleep Research Society, the Japanese Sleep Research Society, and the World Federation of Sleep Research Societies.

[30] Brian Sharkey, 1997, *Fitness and Work Capacity*, (2nd ed.), Tech Report 9751-2814-MTDC, Missoula, Montana: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center, 78 pp.

also show that firefighters are prone to heat stress, dehydration, exhaustion, and heat stroke caused by inadequate fluid intake.

Fourth, as reported in Chapter 4, firefighters we interviewed cited transportation as a fatigue factor. Whether the transportation required is long-distance or local, transportation planners and managers walk a fine line in managing tradeoffs between cost, safety and fatigue. For example, people believe that because helicopter transportation alleviates firefighters from long walk-ins, it is the answer to transportation fatigue problems. However, extensive helicopter transport exposes large numbers of people to the risks of helicopter flight, and tends to concentrate firefighting forces on mountain tops and ridge lines. This factor often raises tactical safety issues such as increasing the risks associated with the downhill hike and the dangers of inappropriate downhill line construction.

Contributing Factors

Some of the factors leading to fatigue, or worsening an already bad situation, are as follows:

Lack of Acknowledgment of Fatigue – The problem of fatigue is aggravated by the lack of crew and institutional acknowledgment of fatigue. Fatigue can cause major safety problems, especially when a crew does not acknowledge its fatigue level, and is not aware of how their potential for getting injured goes up significantly with fatigue. Survey respondents listed this as the highest rated fatigue issue.

Lack of Rest After Dispatch at Night – Study participants felt strongly about being dispatched in the middle of the night and not given adequate rest after their arrival and before receiving an assignment. This is a common situation. Personnel are often immediately assigned to the fireline after receiving little sleep, starting out in a highly fatigued condition that they are unlikely to recover from over the course of a fire assignment. Stories abound of crews arriving exhausted at the incident base after driving all night either from their home base or another fire and being put immediately out on the line.

Desire for Extra Money - Fire crews and fireline Incident Management Team commonly mask or deny their fatigue in order to stay out longer, work more operational periods, and generally do what it takes to make more money. While survey respondents from every geographic area rated this problem highly, it was rated highest in the Northwest and the Northern

Rockies areas. Seasonal firefighters thought that crews working too long to make money was a worse problem than did the permanent employees.

Fatigue Levels Not Checked - Crews often arrive on a fire assignment directly from another fire, but little attention is paid to evaluating their fatigue level. Frequently they are treated as a fresh crew even though they may have been working long operational periods for two weeks.

Reticence in Speaking Up – While it appears that plans and operations personnel rarely ask incoming crews about their fatigue level, it is also true that many crews do not voluntarily speak up about their need to rest upon arrival at the fire. This may happen because of their eagerness to get "on the fire," the objective of earning money, pride in the crew's stamina, or the belief that the crew won't get any sleep at their incident base or camp during the day anyway.

The above considerations lead to Goal 76, another one of the very most important safety issues flagged in this study.

Goal 76. Monitor and reduce fatigue levels to safe limits.

Implementation Strategy 1 – Limit the duration of field assignments to two weeks.

At present, firefighters are allowed to work at one or more fires for three consecutive weeks (21 days.) The agencies should consider limiting fire assignment duration further to 14 or 15 consecutive days, and then sending the person home, with a guarantee of at least 8 hours administrative leave. During periods of extreme need, this policy might be amended to allow 14 days on assignment, followed by two days of rest and recuperation (R&R) without demobilization, followed by 7 additional days, terminating in mandatory demobilization and at least three days off. To be of value, rest and recuperation time must be spent in a quality environment that allows people to clean up, relax, do laundry, and most important of all, get sustained, restful sleep. Motels and dormitories away from the incident base would be best. R&R at incident bases and armories often is not effective, and should be discouraged. To summarize, people should have to rest several days after working two weeks, if at all possible.[31]

The agencies should examine other approaches to assignment lengths including those used in Australian and Canadian wildland fire agencies, and the United States military's experience with fatigue mitigation.

Implementation Strategy 2 – Assure comfortable, quiet sleeping conditions.

Night crews and Incident Management Teams must try to sleep while contending with incident base noise, daylight, and hot daytime temperatures among other things. The agencies must work harder to assure comfortable, quiet sleeping areas in incident bases, particularly for night operations crews and off-duty Incident Management Teams. Additional cost to provide higher quality sleep is justified and the agencies should approve expenditures to improve incident base and camp sleeping conditions. Air-conditioned tents should be considered for night crews in areas with high daytime temperatures.

The least expensive improvement is to provide adequate numbers of ear plugs and eye covers to facilitate daytime sleeping. The agencies should also seriously consider portable structures (large tents, weather ports, other soft-sided structures, and trailers) in which darkened, air-conditioned daytime sleeping quarters can be provided in dormitory or barracks-style. The quality of rest in so-called spike camps also needs to be considered. They can defeat their purpose if the quality of rest is not good.

Implementation Strategy 3 –Improve dissemination of information on the need for adequate hydration and nutrition.

The Forest Service's Technology and Development Program has researched and clearly documented nutritional and hydration requirements for wildland firefighters.[32] However, it appears that the information is not finding its way to the operational level, or is not being implemented operationally. The agencies should use a three-pronged approach to assure that individual firefighters receive and understand this important information and that it influences operational planning and decision-making.

First, training sessions in the skills curricula (particularly those for firefighter, advanced firefighter/squad boss, Crew Supervisor, Safety Officer and medical unit leader) should

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[31] One must be sure that sending someone home does not result in even higher fatigue levels from the added travel home and back, when the distance home is farther than the destination where the person is to be sent next. Therefore, there is a need to consider the R&R option.

emphasize information on firefighter health and safety, especially fatigue mitigation, nutrition, and hydration.

Second, the agencies must make much stronger efforts to get this information out in incident bases in a "public awareness" style campaign including posters in and near field kitchen serving lines and eating areas. Table top nutrition reminders would also be effective.

Third, make a concentrated effort to inform Logistics Section Chiefs, food unit leaders, and caterers about the needs and deficiencies in nutrition and hydration.

Fourth, the most important guidelines from the report *Fitness and Work Capacity* should be consolidated into concise job aids for inclusion in the Fireline Handbook.

Fifth, the above concerns should be reflected in national catering contracts.

Implementation Strategy 4 – Conduct further study of sleep deprivation and other factors affecting fatigue of firefighters.

We already know much about the importance of fatigue and sleep deprivation, but not directly about that of firefighters. The agencies should contract for a study on the effects of sleep deprivation on firefighters and their safety. The study would examine current approaches to operational periods, work-rest ratios, cumulative effects of fatigue over a season, assignment duration, and rest and recuperation policies with the intent of evaluating their contribution to sleep deprivation, and fatigue, and their impact on firefighter safety. The study would increase attention to the issue of fatigue and help convince firefighters (and their agencies) of the importance of getting adequate rest.

Implementation Strategy 5 –Use transportation or spike camps to reduce fatigue.

As discussed in Goal 27, crews, teams, and individuals should be transported where needed with attention to net risk reduction and with consideration of reducing fatigue. Another alternative is increased use of so-called spike camps or coyote tactics, reducing the hike back to an incident base, but only if they can provide adequate quality of rest.

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[32] Sharkey, 1997, op cit.

Information Overload

Information overload is a problem that was raised by many in fire leadership positions. It is also a particular type of stress. Many people do not understand the skills of prioritizing and filtering information, nor do some people realize the danger in flooding people with information. Wildland fire operations can be rapidly moving and extremely complex. Timely information is needed to keep up, but information overload can be devastating, too, if one does not have the skills to filter it. Fortunately, simple techniques can be taught to improve personal information management skills.

Some field research on information overload in the command and control environments of wildland fires found no observable performance degradation due to information overload during a study in which research psychologists observed the functioning of two national level Incident Management Teams during the suppression of a large forest fire.[33] The authors of the study thought that a variety of factors were responsible for shielding the Incident Management Team members from information overload. First and foremost was that these were highly experienced people. It was another case of experience improving decision-making and safety. Second, the authors observed that the Incident Command System provided an effective organizational structure that prevented people from being burdened by too much information, by establishing reasonable spans of control, and by providing the team members with ways to structure and format information. Third, the observed Incident Management Teams benefited from familiarity with each other and teamwork that enabled them to anticipate events, which enhanced their situational awareness. Their experience enabled them to anticipate the goals, actions, and intentions of other people, and to recognize which information was important and which was not. Therefore, they tended to concentrate on the "high pay-off" information, and they did not acquire information faster than they could assimilate or use it.

As the expertise of an individual increases, so does his or her ability to synthesize or "block-up" (i.e., group) information, thereby reducing the amount of raw information that they must deal with. What a relatively inexperienced person sees as 10 pieces of information, the experienced person might see as one or two.

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[33]J. Taynor, J., G.A. Klein, & M. Thordsen, (1987), Distributed Decision-making in Wildland Firefighting (KATR-858(A)-04F), Yellow Springs, OH, Klein Associates, Inc. Prepared under contract MDA903-85-C-0327 for U.S. Army Research Institute, Alexandria, VA.

One might conclude from the above study that the wildland fire agencies are in good shape when it comes to preventing information overload. However success in preventing people from becoming overwhelmed with too much information is very dependent upon the experienced and level of expertise of the individuals involved. The challenge is to transfer successful information processing techniques to team leaders and crew members.

All available evidence suggests that experience levels have declined. We speculate that so has the ability to deal with information overload. Judging from the many who raised this as an issue in the interviews and surveys, it should be taken as a serious problem, which led to the following goal:

Goal 77. Crew Supervisors, Division Supervisors, and Incident Management Teams must get the information they need, but also be shielded from a flood of unnecessary information, and the risk of information overload.

Implementation Strategy 1 – Be selective on what is broadcast and what is requested.

Most of what is needed to reduce information overload and to deal with it is addressed in other goals. The reduction of information overload is the purpose of the strategies in Goal 37 on reducing the numbers of orders and rules, and Goal 19, on training people to use the radio efficiently. The goals related to building up experience levels again. The purpose of several other goals also leads to people able to cope with information in the field.

For people to be able to determine whether information is necessary or unnecessary, they need to understand the "big picture." Strategies contained in this report related to situational awareness, learning risk management skills, information flow dynamics, interpersonal communication, and briefings are critical to achieving better situational awareness and giving people the tools they need to get adequate, pertinent information and manage information overload.

Training a firefighter or fire manager to avoid information overload does not require additional courses. Rather, it should be viewed as a natural extension of our recommended emphasis on two-way dialogue (not one-way command). The related principles are working to acquire/share vital information while personally learning to ignore information that is not worth paying attention to.

Realistic decision-making training under stress addresses this problem by providing skills to the firefighter to manage information. Simple skills to determine what information is critical

to understanding a situation (and what adds no value) and how to acquire it (by talking within a crew, by asking for it) are part of decision training, discussed under Goal 74, Implementation Strategy 1.

Physical Fitness

The agencies introduced fitness testing to the process of selecting wildland firefighters to help reduce the number of heart attacks and other physical fitness-related injuries and illnesses experienced by firefighters. The Step Test (and alternate 1½-mile run) have been in place since 1975. Consequently, while the leading cause of deaths to structural firefighters has been heart attacks and strokes, very few wildland firefighters die from heart attacks or stress at fires despite their strenuous activity.

Despite the excellent record to date, physical fitness issues were among the highest rated problems identified for improving safety in the interviews and survey in Phase I. The three big issues raised on physical fitness were the validity of the step testing process (some seemingly fit individuals struggle to pass it), the veracity of the test process (some unfit people are intentionally passed), and the wide variation in physical fitness for Type II crews.

Many respondents strongly believe that the step test is not a good indicator of real-world performance in the field. Both men and women said that the physical fitness test should be gender-blind. They felt that women should be expected to pass the same physical test as men, especially if it was for stamina or skills related to fireline performance. A number of firefighters made the point that someone could be overweight but have the stamina and ability to walk up a mountain and do strenuous physical work, though they did not do well on the step test. This was mentioned especially for physical types common in certain ethnic groups. Most study participants felt less strongly about exactly what new test might replace the step test than that the new test address their objections.

There is also a significant minority of firefighters who do not understand or do not accept the importance of physical fitness standards, even if intended for their own good. (We found the strength of this feeling somewhat surprising in light of the very positive life-saving results that have been achieved.) They need further information on the benefits, and convincing by their peers.

Recent laws (including the Americans with Disabilities Act), field experience, and research on long-term work capacity have caused the agencies to reevaluate their current approach to physical fitness testing. The proposed new pack test series – three different levels of work capacity tests relating to "arduous," "moderate" and "light" duties – resulted from that initiative. The NWCG concluded that:

- The Step Test (and alternate 1½-mile run) does not meet Federal standards for testing employee fitness.
- The Step Test and 1½-mile run are not directly performance related.
- The post-exercise heart rate count used in the Step Test is difficult to perform accurately and incorrect fitness assessments result.

The new wildland firefighter physical fitness test (the Pack Test series) has been developed by Dr. Brian Sharkey and is being evaluated for adoption. It is more directly work-related than the Step Test, and is in final testing and validation review. Many respondents commented favorably about the "Pack Tests."

On a related issue, study participants indicated that there was at least some cheating that allowed people to slip through without passing a physical fitness test, and that many people were allowed to work on the fireline without having their fitness credentials checked. Like the training and experience requirements, the physical fitness test needs to have credibility and needs to be enforced as the third leg of the qualifications system.

Type II Crews - There was a strong consensus among those responding to the national survey that many firefighters in Type II crews are not sufficiently physically fit. (Virtually no one during the interviews raised questions about Type I crew fitness other than to praise it.) Almost 50 percent of the survey respondents said that physical fitness of Type II crews was a high priority for improvement.

A number of interviewees said that the problem was complicated by there being a wide range of fitness levels across Type II crews, which makes it difficult to safely match assignments to crews. This is a clear safety issue and a significant challenge for those who have to assign crews to tasks on the line without adequate information on their physical condition.

Contract Crews - Study participants showed the greatest concern over the physical fitness of contract crews, who are expected to be used more as the Federal firefighting workforce decreases. They may not have the same physical fitness as the Federal crews. Some dispute this concern as a misperception and believe that most contract crews are comprised of adequately screened personnel.

State Crews - The Federal firefighters expressed a virtually identical concern about the physical fitness of state crews as they did about contract crews. It was felt that some states do not have or do not adequately enforce firefighter physical fitness standards.

Incident Management Team Fitness – More attention to physical fitness training was also considered a need for Incident Management Team personnel. Some felt team personnel need to be in reasonable shape to walk the line, work at base camps, and handle the stress of the job. Slightly over half of the survey respondents thought that physical fitness of team personnel was a medium to high priority problem.

The above concerns led to Goals 78 through 80.

Goal 78. Develop a widely accepted physical fitness test for wildland firefighters.

Goal 79. Physical testing must be conducted honestly and for all.

Goal 80. Minimize wildland firefighter fatalities from health or physical conditioning factors.

Implementation Strategy 1 – Finish validation and acceptance testing of the Pack Test series or another new physical fitness test, and rigorously enforce the new test.

A widely accepted and validated physical fitness test must be put into effect as soon as possible. With the old test judged invalid and no new test to replace it, this is a critically important task of the highest urgency. If given final approval, all five agencies should adopt the proposal "Pack Test series," which is a family of three related physical screening tests as documented in Physical Fitness and Work Capacity.[34] The pack test series is a gender-neutral, widely regarded as work-task related, and effective in testing the fitness of firefighters of

[34] Brian Sharkey, 1997, op cit. See also the USDA Forest Service briefing paper, "Questions and Answers: Pack Test."

different sizes and weights. The Pack Test series is undergoing pilot testing and further review in 1998.

Implementation Strategy 2 – Require contractors and encourage all others at Federal fires to meet the new physical fitness test.

The agencies should continue to require contractor personnel to meet the federal wildland firefighter fitness standard used by the agencies, and should see that the new standard is implemented. The agencies have flexibility under the ICS 310-1 (Wildland Fire Qualification Subsystem Guide) to establish appropriate physical fitness test(s) for their contractors as well as employee personnel.

By agreement, all NWCG members, including state agencies, accept each others' personnel for fire duty based on each agency's own standards. The Federal agencies should, through the auspices of the NWCG, continue to encourage all member organizations to adopt and implement the new Pack Test series or whatever test is ultimately accepted.

Implementation Strategy 3 – Educate the workforce about the new test.

The information on the new test needs to find its way to the operational level. The agencies should assure that managers and supervisors at operational levels of their organizations, as well as individual firefighters, receive and understand this important information and that it influences operational preparation of firefighters.

Implementation Strategy 4 – Hold testers accountable.

Anyone who allows people who are not fit to be certified as passing a fitness test should be held accountable.

Crew Dynamics

Although Phase I survey participants did not include crew dynamics issues in their most highly rated problem areas, some of the most knowledgeable experts on crew behavior in the wildland fire environment and on unit decision-making under stress in other environments believe that crew dynamics, particularly crew cohesion, is extremely important to safety.

Crew Cohesion

Research shows that closely knit crews communicate better, make better decisions, care more about helping each other, and respond to instructions more quickly and accurately, especially in emergencies. Unit cohesion is needed to maintain discipline in uncertain and dangerous situations and for people to think and work cooperatively.

In the wildland fire community, people tend to cite Type I crews, particularly Hotshot crews, as models of unit cohesion. We believe this is because they typically:

- Train together.
- Maintain their crew structure away from fire assignments and work together during non-fire time.
- Live together in barracks or dormitory settings or at least spend a great deal of time together.
- Tend to have fairly low turnover, maintaining considerable crew continuity from season to season.
- Screen their members fairly carefully, seeking proven performance.
- Have a common background or organizations of origin.
- Have succeeded together as a team.
- Have good leadership.

Most Type II crews do not enjoy many of these attributes and are often a collection of relative strangers. The challenge of creating unit cohesion on Type II crews can be very difficult and requires different approaches than might be used with Type I crews. However, crew cohesion is not a problem unique to Type II crews; some Type I crews also will benefit from initiatives to improve crew cohesion.

Crew Resource Management (CRM)

This report contains several references to Crew Resource Management (CRM) training as a potential solution to several problems, including improving crew dynamics. CRM is a model for cultural change that has been used in the aviation environment since the 1970s; it has been effective in improving operational efficiency and reducing safety problems. It is one of many

tools the agencies should employ as part of a comprehensive strategy to change their organizational safety culture.

Participants of the 1995 Human Factors Workshop devoted a considerable amount of their effort to exploring the wildland fire applications of CRM and recommended that CRM-type training remedies be applied to strengthen crew and crew member performance in the wildland fire environment.[35] CRM training directly addresses many aspects of human performance and crew dynamics, including communication, decision-making, leadership, situational awareness, and barriers to these processes such as stress, conflict, and potentially hazardous attitudes. The goals of CRM training is to improve crew effectiveness, reduce the occurrence of error, and improve safety.

CRM training focuses on individual performance and attitude. The resulting attitude changes are effective because they both directly assist the crew member in working within the crew and present an example for others. CRM training helps each crew member think about his or her individual situation, including job duties and barriers to performing those duties. They help them develop individual strategies for combating potential safety problems caused by human error.

History of CRM – CRM originally stood for Cockpit Resource Management. It was first coined for training crews to reduce pilot error, and make better use of human resources. A NASA research project found that many air crashes resulted from failures in interpersonal communication, decision-making, and leadership, and this training concept was a response.

The first comprehensive CRM course was started by United Airlines in 1981. It was derived from corporate management development training. It emphasized changing individual styles and correcting deficiencies in individual behavior such as a lack of assertiveness by juniors and authoritarian behavior by captains. Starting about 1990, the airlines included other aircraft crew members in the training, and renamed it **Crew** Resource Management.

CRM then was adapted to other industries, including medicine, engineering testing, maintenance, and offshore oil exploration. CRM also became more specialized in aviation, addressing problems such as flight deck automation. The Federal Aviation Administration now

[35] USDA Forest Service, Fire & Aviation Management Technology & Development Program, Findings From the Wildland Firefighters Human Factors Workshop, 9551-2855-mtdc, Missoula, Montana, 1996.

requires that CRM concepts be integrated into the airlines' technical training curricula. This resulted in the development of aircrew target behaviors and skills, which the airlines now include in operational procedures and checklists.

Cross-cultural/environmental considerations of CRM – There have been problems in exporting CRM to some organizational cultures. CRM training targeted specific crew member behaviors in mostly Anglo aviation environments. Some of the behaviors were not readily acceptable to some cultures, for example, the notion of verbally challenging authority, especially when a specific wording was suggested. Also, by integrating CRM into other forms of training, some of the original focus on error was weakened. This led to a shift in CRM training from recommending very specific actions and words, to explaining an approach for determining what to do and say. That is, CRM training in non-aviation settings solved some of the cross-cultural problems by refocusing the CRM concepts on the goal of error reduction and error management rather than on specific, pre-selected target behaviors.[36] Even so, a CRM course will still require some adjustment for group differences.

The bottom line is that CRM-type training can be adapted to meet the needs not only of wildland firefighting in general, but also can be adapted to individual organizational subcultures (e.g. Smokejumpers, Hotshots, Native American firefighters, etc.). We use the term "CRM-type" training rather than "CRM training" to describe the potential final products after needed adaptations.

Methods –There are many forms of CRM-type training. Most involve some type of experiential learning process that is facilitated, not instructed. This training helps people change their attitudes about how they operate, so that they can improve the way they function. Because every person has a different set of attitudes and experience, the attitude change resulting from these programs may vary from individual to individual. In the end the participant needs to be able to adopt a change in attitude and strategize methods of improving personal performance in the future.

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[36] Research in non-aviation environments and in cross-cultural studies by Robert Helmrich and Ashleigh Merritt of the NASA/University of Texas/FAA Aerospace Research Project (1996) found that many cross-cultural barriers can be reduced by refocusing CRM on its initial root – error reduction – which is a more universally accepted goal across cultures. This is also consistent with research on national culture differences discussed in G. Hofstede, *Culture's Consequences: International Differences in Work-Related Values,* Beverly Hills, California: Sage, 1980.

An experiential learning cycle involves the stages of experiencing, "publishing," processing, generalizing, and applying. For example:

> *During a simulated blow up, an Incident Management Team uses their knowledge and experiences to deal with the situation (experiencing). During debrief they go into sharing (publishing), look at habits they have or need to develop (processing), discuss how things could/should be different (generalizing), and then go on to examine how to apply new skills (applying). Next time they are experiencing similar circumstances they should relate their new skills to the situation (back to experiencing, etc.).*

Taking learners through this cycle usually requires strong, well-developed facilitation skills. The strategies formulated by the crew members during this process are individual and can address a variety of problems/issues that are identified within the workshop.

Approach – To get the most from the CRM-type training, the agencies must employ it as part of a comprehensive strategy including other organizational remedies. For example, the agencies need a management stance and culture that encourage personnel to report errors. Error reporting is a critical support element for successful culture-wide (not just crew-wide) CRM implementation. (See the related discussion of Goal 3 in this report.)

Many of the safety concerns uncovered in this study relate to human error. Adopting a CRM approach and CRM-type training represents a fundamental and important cultural change that could dramatically improve firefighter and Incident Management Team effectiveness. As a remedy that directly addresses human attitudes and behavior, the potential impact of this approach on organizational effectiveness and safety could be far reaching.

Goal 81. Foster better crew cohesion, especially among Type II crews.

Implementation Strategy 1 – Adapt and adopt CRM-type training and attitudes.

We concur with the findings of the 1995 Human Factors Workshop that most of the organizational and interactive behaviors that are part of CRM are relevant to the wildland fire community. Some of the high level components of CRM that are applicable include teaching:

1. Situational awareness
2. Mission analysis

3. Decision making
4. Communication
5. Leadership
6. Adaptability
7. Assertiveness[37]

Components of CRM-related behaviors as they apply to wildland firefighting are well documented in Findings From the Wildland Firefighters Human Factors Workshop.[38] This set of skills helps get crews and teams to work together, versus just taking orders from a leader. The agencies, through the NWCG, should adopt the principles of the CRM approach.

"CRM" has come to mean many things to different people in the wildland fire community, creating some confusion and dampening the concept's potential as part of a comprehensive approach to improve firefighter safety.[39] Therefore, the NWCG should uniquely name their interagency CRM-like approach for the wildland fire community (i.e., stop using "CRM"). The participants of the Human Factors Workshop suggested "Fire Crew Dynamics" and/or "Fire Team Dynamics."

Implementation Strategy 2 – Develop assessment instrument to periodically refine CRM-type training.

As mentioned, the aviation industry has experienced some failures exporting CRM training to other organizational or cultural environments, by prescribing specific crew member behaviors which did not effectively transfer to different operational and cultural environments.

Successful applications of CRM in the aviation community now are continually refined for various cultures via the "Cockpit Management Attitudes Questionnaire" (CMAQ),[40] and its later version, the "Flight Management Attitudes Questionnaire" (FMAQ). The FMAQ measures attitudes about issues such as crew cohesion and leadership style. The results determine the

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[37] Assertiveness became associated with CRM because of the need for a co-pilot to be assertive in pointing out problems to the pilot. Assertiveness also represents a skill area of great importance to the wildland firefighting community (e.g., a subordinate speaking up about safety; minorities and females being assertive).
[38] USDA Forest Service, Fire & Aviation Management Technology & Development Program, Findings From the Wildland Firefighters Human Factors Workshop, 9551-2855-mtdc, Missoula, Montana, 1996.
[39] L. McDonald, "Are We There Yet?" Wildfire, Vol. 6, No. 4, August 1997.
[40] Cockpit Management Attitude Questionnaire (CMAQ), (Helmreich, 1984; Gregorich, Helmreich, & Wilhelm, 1990.

baseline "culture" before organizations introduce CRM-type training or other interventions. In other words, organizations use the FMAQ to focus their CRM-type training. NASA and the University of Texas Aerospace Program have produced a data base developed from more than 30,000 responses to these inventories which have been used to assess values and to direct CRM-type training efforts in a variety of cultures.

Recently, the FMAQ has been modified for use outside of the aviation environment, including fields as diverse as medicine, petrochemicals, and manufacturing. It can be used to assess or predict an organization's ability to indoctrinate CRM-type concepts into their culture. M C Solutions, Inc. of Denver, Colorado has recently modified the FMAQ for use in the wildland fire community. They are pilot-testing a "Crew Member Attitudes Questionnaire" (CAQ) with 20 Hotshot crews in a privately funded effort.

The agencies should use an assessment mechanism such as the FMAQ/CAQ to evaluate training needs particular to subcultures within the Federal wildland fire management community. These subcultures might include different agencies, Type I versus Type II crews, EFFs, Incident Management Teams, Smokejumpers, Hotshots, etc. The assessment tool would evaluate training needs based on attitudes toward the various components of CRM defined in the findings of the Human Factors Workshop.

For example, let's say that the CAQ indicates that the crews of some ethnic group have what is known in CRM circles as "a High Power Distance Factor," which stresses the absolute authority of leaders, common in many countries. In this case, content areas regarding consensus decision-making or assertiveness training may be slimmed down or changed, while subject content revolving around leader-based (hierarchical) decision-making functions and barriers might be increased. Alternatively, more effort could be given to consensus training. In both cases, the information would be tailored by the facilitator to fit within the prevailing cultural norms so that the new attitudes and strategies can be accepted.

Implementation Strategy 3 –Infuse CRM principles throughout training.

Because its application can be particularized to different applications, CRM training can be beneficial to many types of organizational groups. Although the greatest benefit of CRM training would be initially felt at the operational levels, the training is appropriate to all levels of operations and management.

CRM concepts may be particularly critical for the Single Resource Boss level. However, the training curricula should begin to establish a foundation for CRM concepts starting right at the firefighter level, and continue to comprehensively reinforce and expand the concept throughout the curricula. The Fatality Fire Case Studies course under development will introduce advanced firefighters to CRM concepts. This will provide a foundation for infusing the CRM concept in the fire training curricula, assuming the course becomes mandatory training. The Fatality Fire Case Studies course is being developed by Jim Cook of the Boise Interagency Hotshots and scheduled for beta testing in Spring 1998.

The National Park Service pilot-tested a compressed (8-hour) CRM module at their 1997 Crew Supervisor Academy.[41] The session presented introductory information on the essentials of the CRM concept and led people through exercise scenarios. The training cadre found that non-fire examples (air crash, aborted missile launch, etc.) were effective because they focused people on learning about the concept rather than on the exercise content. The cadre felt that because students did not get wrapped-up in the tactics of "fighting the fire," they were able to focus their learning on CRM concepts for later application.

We provided examples of where to infuse CRM-type training under various goals discussed earlier. Our recent review of S-201 (Supervisory Concepts and Techniques) and S-301 (Leadership and Organizational Development) revealed that these newly available courses represent logical places to infuse and reinforce CRM concepts. The agencies should review the entire incident management and prescribed fire curricula and infuse "CRM" concepts wherever appropriate. That effort should pinpoint courses where the most impact can be made, focus redevelopment efforts on those courses and require those courses in the performance-based training and qualification system.

In addition to those mentioned above, courses with potential for inclusion of CRM concepts include: S-110 (Basic Fire Suppression Orientation), S-130 (Firefighter Training), S-131 (Advanced Firefighter Training), S-200 (Initial Attack Incident Commander – ICT4), S-230 (Crew Boss – Single Resource), S-231 (Engine Boss – Single Resource), S-232 (Dozer Boss – Single Resource), S-233 (Tractor/Plow Boss), S-300 (Incident Commander, Multiple Resources), S-320 (Unit Leader), S-330 (Task Force/Strike Team Leader), S-339 (Division/Group Supervisor), S-378 (Air Tactical Group Supervisor), S-400 (Incident

[41] The module was team-taught under the guidance of Lark McDonald of M C Solutions, Inc.

Commander), I-420 (Command & General Staff), S-430 (Operations Section Chief), and S-440 (Planning Section Chief).

As CRM concepts are introduced in the low and intermediate level courses, it will also be necessary to include at least a condensed summary of the ideas in the S-520 (Advanced Incident Command) and S-620 (Area Command) courses. After several years, when most people have had CRM training on the way up, there would no longer be a need to introduce them in the higher level courses, though the CRM principles (e.g., respectful interaction, querying, acknowledgment) would still be used in exercises or simulations.

Implementation Strategy 4 – Employ team building technologies when teams first meet.

People size up each other when they first meet. This was confirmed in the course of research conducted by the U.S. Air Force Academy, which found that attitudes, perceptions, and conclusions are drawn almost immediately by both leaders and crew members.[42] These initial perceptions remain in effect until something happens that proves them otherwise. The longer these perceptions and attitudes stay in place, the harder they are to change.

Crews frequently rely on time to eventually solve cohesion problems. However, operational cohesion does not have to be tied to how long a crew has worked together. Studies conducted by the military indicate that newly assembled teams can work as effectively as longer standing crews if critical cohesion components are addressed. Respect, well-defined and communicated roles and responsibilities, and active control of barriers to cohesion are some of the critical components required for a cohesive crew, whether they are newly assembled or a standing crew.

The agencies' leadership training, especially for Crew Supervisors and other unit team leaders, should focus on immediately developing the components of cohesion critical for operational effectiveness, and define methods for leaders to identify and correct deficient areas. CRM-type training can be useful in assisting leaders to identify and correct cohesion barriers and improve leadership performance. Unit formation skills include the following:

- Being sensitive to the fact that when teams are assembled, people size each other up in the first ten minutes. Effective leaders, hoping to establish and maintain a cohesive

[42] Ginnett, 1992.

unit, must understand that this is known to happen and make the most of that initial meeting period. A Crew Supervisor could explicitly say something to the effect that "many of us don't know each other yet, but we need to get acquainted", and then get each person to say something about their background, interest, and experience.

- Facilitating agreement on what makes an effective crew (internal measures of success and external measures of success), also thought off as establishing shared goals and intent. For example, leaders can develop shared goals and intent by deliberately engaging people in a discussion of the unit's purpose. An effective way to accomplish this is by using a training technique known as the "Commander's Intent" exercise. In these exercises, the leader describes what it is they want to accomplish. One of the participants then introduces an unexpected variable. The leader writes down how he or she believes the variable will impact the "commander's intent," as do the subordinates. Afterwards, they compare notes to establish whether leader and followers share goals and intent. (This exercise is included in our recommended training on decision-making, discussed in Appendix C.)[43]
- Immediately establishing roles and functions for each crew member, so that people understand their role and responsibility, the roles and responsibilities of others, and their interrelationships from the outset (positions like those in a Hotshot crew could be assigned – hot shovel, lead pulaski, etc.). The leader can also establish roles and functions by asking people to participate in a simple training exercise. During the exercise, each team member describes with whom on the team they will interact; what they need from those people and what the others need from them. This exercise provides an opportunity for people to articulate their current mental model of how the unit will function, it allows the members to jointly find the limitations in those mental models and confront them.
- Establishing trust between crew members, including the leader.
- Recognizing the needs of others before being asked (anticipation). The key to recognizing the needs of others is understanding their role or job. Therefore, the exercise described above can be employed to produce this desired effect as well.
- Providing clear expectations and desired outcomes, including the crew member's responsibility to communicate and report problems. Leaders can accomplish this through use of the Commander's Intent exercise described earlier.

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[43] Some of the exercises described here may be culturally unacceptable in some Native American communities, noted a BIA reviewer. Sensitivity to such issues must be kept in mind as one develops training programs and other changes to the organizational culture. Adaptations may be necessary.

- Focusing on results. Leaders should express goals in terms of outputs or results, not activities. For example, "establish a fireline from the creek to the division break" versus "dig fireline." Supervisors who express goals in terms of activities get lots of activity, but few results.
- Coaching to gain commitment and maximum productivity. (Coaching skills are discussed in Appendix B on on-the-job training.)
- Establishing multiple means of communication, including redundant or backup methods (voice communication, tone of voice, eye contact, hand signals).
- Understanding personalities – the responses you can expect and anticipate from a person. Leaders can achieve this by striving to recognize and understand current as well as past behavior, anticipating future behavior, and influencing or dealing with that behavior.
- Establishing high cohesion without creating blind trust (i.e., encourage respectful questioning of the leadership as appropriate). "Pre-mortem exercises," as discussed in Appendix C of this report, provide a respectful way of having an entire team share its worries about a plan.
- Fostering tight cohesion at the team/crew level without causing mistrust or distrust outside of the team (including division supervisors, strike team leaders, etc.), or countering the larger organization's goals.

The agencies need to consider (and perhaps experiment with) providing time for "team building" or "unit cohesion" when crews or teams are assembled for the first time. During this period (perhaps one day) the team leader and team members would exclusively and deliberately work to establish the teamwork atmosphere described above.

Implementation Strategy 5 – Consider use of outside vendor for CRM development and training.

To speed up adaptation and adoption of CRM, the agencies should consider contracting with an organization that specializes in CRM to provide a wildland fire version of CRM, and to maintain the courseware. It would be used initially with Type I standing crews, Type II crew leaders, and Incident Management Team across agencies. This recommendation is consistent with the recommendations of the Human Factors Workshop.

The training needs to be ongoing, recurrent, and continue to evolve as the culture evolves. Organizations that assign internal resources to do CRM as another job in a list of jobs

have almost invariably seen their programs fail. For example, the Air Force started with specialist CRM contractors in 1988 and their accident rates went way down. The Air Force then had the contractors train Air Force cadres in CRM and started teaching it themselves to save money. The individuals trained in CRM never stayed in place, and the "critical importance" of CRM was lost when the CRM courses were thrown in with other courseware. Within a few years, CRM courseware was being redeveloped and administered in pockets and the accident rates started climbing again. Currently, the Air Force is working to reassemble a system-wide CRM initiative and start again.

As a program which is involved in changing attitudes and looking at things in a new light, CRM conducted by outside contractors tends to be more effective. In part this seems to be because people lend credibility to "experts." In part it is the level of focus and consistency that specialized vendors can provide. The real secret to this training is not in the printed facilitator guides, but in the delivery and conduct of the course. Focusing on the right things is very important.

Another benefit to using external vendors here is the turnaround time on courseware evolutions. As the environment changes and incidents happen which have human factors relevance, they can be incorporated immediately into the program. Courses in the standard curriculum tend to be revised according to a prescribed schedule, and can be out of date until their scheduled revision.

Ideally, a CRM program should be managed and funded at a fairly high organizational level. This prevents the program from being hijacked or undermined. It also gives management the ability to focus the effort on current trends it wants to address from an organizational standpoint.

Unfortunately, the wildland fire community currently has a relatively small budget allocated for training. CRM training will compete with other similar soft-skill training programs, and it is expensive per student when compared to NWCG courses. The agencies should consider maintaining a separate training budget line for CRM and perhaps other high priority new training thrusts.

Implementation Strategy 6 – Develop work climate of trust through changes in the culture.

The implementation of many of the goals and strategies discussed elsewhere in this report will help create a work climate that establishes trust and respectful interaction, the basic elements

of team building. The agencies will be encouraging communication and interaction by consistently and comprehensively preparing all firefighters with a common frame of reference, training all firefighters to use a common vocabulary to describe their working environment, and by the actions and conditions the firefighters observe and the situations they encounter.

Goal 82. Develop a safety culture that encourages people to think in the context of safe practices, standards and procedures.

Implementation Strategy 1 – In addition to all of the above, get firefighters and managers to raise safety consciousness in day-to-day activities.

Among all the proposed solutions that were included on the firefighter safety survey, respondents gave one of the very highest rankings to "develop a culture that encourages people to think." The agencies will eventually achieve that cultural change by implementing strategies discussed under a variety of other goals, especially Goal 20 (adequate information).

Developing a safety-oriented culture can be fostered through the incremental contributions of everyone from firefighter to fire program manager.[44] Senior managers need to frequently ask about how various new programs or ideas will affect safety, and to praise individuals or groups who contribute good safety-related ideas.

Debriefing at fires should raise the question, "How did the action match or miss meeting safety considerations? How close did we come to having an incident?"

Various individuals, especially those firefighters people look up to, need to be encouraged to discuss safety issues informally, among members of crews.

Stories of positive and negative examples need to be spread, perhaps with a newsletter, as suggested earlier.

Starting new initiatives and following them up will also send signals, and encourage thinking about safety. It will be a whole collection of actions that will change the culture.

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[44] Charles Perrow, "Developing a Cooperative Approach to Wildfire Protection," TriData Corporation, 1998. Paper developed for fire program managers on how to change the culture, presented at the Federal Fire and Aviation Leadership Council, Boise, Idaho, January 6, 1998.

Summary

This chapter on Human and Psychological Factors addressed self-image; professionalism; situational awareness; substance abuse; training, including availability, quality, realism, and training on-the-job; personnel practices; fatigue; crew dynamics; physical fitness; decision-making under stress; and individual responsibility.

The next chapter shifts focus from the individual to factors outside of fire suppression that affect the safety of firefighters.

CHAPTER 6. EXTERNAL INFLUENCES ON SAFETY

This chapter discusses the largest outside pressures that affect wildland firefighter safety. They include public and political pressures regarding which fires to fight and how to fight them; diminishing budgets and resources for firefighting; and forest health. The growing interdependence of various levels of government involved in firefighting might also be considered an external influence, but was already discussed in Chapter 4.

Public Fire Safety Education

Public perceptions and expectations of wildland firefighters and firefighting are often formed from a lack of information, misinformation and inadequate understanding of wildland fire management and, in particular, the wildland-urban interface problem. The issue is summed up as follows in the publication Course to the Future: Positioning Fire and Aviation Management:[1]

> "The public's expectation for wildfire protection is growing. Development at the wildland/urban interface, coupled with demand for forest resources continues to escalate. Remarkably, this escalation is occurring with little public understanding – or tolerance – for the ecological processes necessary for the health and sustainability of forests over the long term."

The report includes the following findings:

- Increasing public use and interest in public lands creates greater demands and conflicts.
- Internal and external awareness concerning fire's role in the ecosystem is limited.
- Public concern and expectations are not aligned with the Forest Service mission and capabilities.
- Population in the wildland/urban interface is increasing rapidly, and it expects and uses a significant amount of wildland protection resources.

[1] USDA Forest Service Fire & Aviation Management, Course to the Future: Positioning Fire and Aviation Management, Washington, DC, 1995.

- Wildland/urban realities, fire safe design and fuels management practices are not well understood or accepted by the public.
- The wildland/urban interface contains hazards that wildland firefighters are ill-equipped and ill-prepared to confront.
- The Forest Service Manual direction for planning wildfire suppression strategies prioritizes the protection of life (both the public and firefighters) above protecting natural resources and private property.[2]
- Due to the increased population and private development within the interface, *public concern and expectations influence decisions and the commitment of Federal resources.*

These findings apply, in some degree, to all of the agencies participating in this study. The last point especially implies (though does not overtly state) the critical link between the attitudes and perceptions of the public and firefighter safety. Public pressure to stop a fire when there are insufficient resources present can endanger firefighters.

Many members of the public have a more personal stake in wildland fire management than ever before. The interface population is burgeoning. More people are using public lands. Public expectations are high and influence strategic and tactical decisions that bear on firefighter safety. Decision makers on fires sometimes address public pressures by placing priority on protecting private property, and sometimes this is at the expense of firefighter safety, whether inadvertently or not. The agencies must do what they can to inform the public, the media and all levels of political leadership to bring public expectations in line with ecological reality, and with agency missions and capability.

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[2] The 1995 Federal Fire Policy orders the priorities as 1) public and firefighter safety, 2) protection of resources, 3) protection of property.

The agencies have conducted many fine public outreach efforts in the past and continue to do so. They and various NWCG working teams have conceived or planned several promising initiatives for implementation in the near future. What is lacking is a comprehensive, coordinated strategy to assure that vital information is getting to the target audiences in sufficient quantity and with the desired effect. For example, the NWCG formed a Wildland/Urban Interface (WUI) Advisory Group to provide a forum to increase public awareness of the wildland/urban interface problem. The NWCG also sponsors the Wildland Fire Education Working Team (WFEWT).

The NWCG Wildland/Urban Interface Advisory Group maintains an Internet website which provides a central point of contact for mass distribution of prevention information. However, website visitors must request publications through the Publication Management System (PMS) of the National Interagency Fire Center. The PMS was designed to primarily serve interagency clients from government agencies. The National Fire Protection Association (NFPA) produces an extensive catalog and will provide some specific publications and videos from the NWCG agencies on request. However, the NFPA primarily serves a fire department clientele and does not handle or list products that compete with NFPA catalog products. The U.S. Fire Administration also handles some products from the NWCG group. While the efforts to educate the public have been fragmentary and not wholly coordinated, the goals remain clear:

Goal 83. Educate the public on the limitations and dangers of wildland firefighting.

Goal 84. Educate the public on the specific mitigating factors that may influence wildland fires and reduce damage from them.

Implementation Strategy 1 – Promote public education on the limitations of firefighting and practical mitigation efforts through a variety of venues.

The fire programs in the five agencies have been promoting Smoky Bear and other safety education efforts successfully for decades. The education efforts have focused on preventing the ignition of fires, with considerable success.

More recently, efforts have started through a variety of means to educate the public on the need for prescribed fire, and the measures people can take to better protect themselves in the urban-wildland interface zone. The agencies spend far less time informing the public on the limitations of wildland firefighting once a fire gets going, and the need for fire authorities to consider what is feasible and prudent when choosing a fire suppression strategy. These are more

difficult concepts to get across, especially without denigrating what is possible. Nevertheless, the point needs to be made in articles, various contacts with the media and formal public education programs.

Homeowners who live in or are planning to build homes in places that are frequently susceptible to fires should be advised of the danger, and should be advised that there may be many situations where firefighters may be unable to stop a wildland fire from destroying their home. The public needs to understand that the danger of moving into a forest that periodically has fires is the same as building a house on a seashore regularly buffeted by hurricanes. People do not expect emergency management forces to stay and buckle down their house, nor to face hurricane winds or tornadoes. They have to understand the same is true for wildland fires. They need to understand that, just as a river in full flood may overwhelm a line of sandbags, a fire driven by winds may overwhelm a fireline. Residents of flood-prone areas recognize that there is a point at which the sandbags cannot hold and the defense switches to an evacuation of the community. The same switch occurs in urban interface fires; however, even the potential for evacuation often comes as a surprise to the residents. They need to understand the priorities in Federal fire policy.

This educational effort will hopefully motivate the public to support mitigation of fire risks by homeowners and agencies, and also to decrease the political pressure for firefighter heroics to save homes. It may also help in dealing with the media and politicians when a fire could not be stopped if the homeowners involved had been advised of the danger ahead of time.

Both the top fire leadership, the Information Officers at fires, and in general the whole fire community need to take advantage of various opportunities to educate the public. Some specific approaches are noted below, but what really needs to be thought out is a different, intense national public education program to get the above messages across.

Implementation Strategy 2 – Broaden the efforts of the Wildland/Urban Interface Group, and link them to others.

The NWCG should expand the membership of the WUI Advisory Group to increase participation of opinion leaders from outside Federal agencies and from fire and emergency

services associations. For example, opinion leaders from the real estate, insurance, building, and landscaping industries should be involved.[3]

The agencies, through the auspices of the NWCG, should connect the efforts of the WUI Advisory Group and the agencies' strategic efforts to improve firefighter safety efforts. Appropriate initiatives of the WUI Advisory Group, the Wildland Fire Education Working Team (WFEWT), and the Safety and Health Working Team should be linked. Comprehensive, coordinated effort should be the intent, with the end being greater outreach and more bang for the buck. Linking these related efforts into a comprehensive approach might be a useful and logical mission for the "Fire 21" cadre in cooperation with the NWCG.

Implementation Strategy 3 – Use the Internet.

The agencies, perhaps through the auspices of the NWCG, should enlist the cooperation of representatives from national building, architectural, landscaping and recreational organizations, and form public-private partnerships to link the FireWise Homepage and the planned NWCG Homepage to websites commonly used by the public to obtain information on real estate, insurance, building, architecture, landscaping, and recreation on public lands. Those planning to build in wildland areas need to know the risks (e.g., frequency of large fires in their area) and how they can mitigate them (e.g., landscaping, cleared space, construction materials, etc.).

The agencies, the WUI Advisory Group and the WFEWT should distribute publications and literature to the public through mechanisms that are "user friendly" and familiar to the public, including use of the Internet. The agencies are currently using the PMS distribution system and making some use of the Internet. However, the agencies should seriously consider a commercial-styled Internet bookshop and/or links to existing commercial booksellers such as Amazon.com.

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[3] A project we undertook for the fire program of the State of Washington Department of Natural Resources received considerable support from these outside groups. It was important to determine what they were doing on their own, and how much moral and practical support they were willing to lend.

The WUI/FireWise and NWCG homepages should also be linked to the homepage of the National Fire Protection Association (NFPA), U.S. Fire Administration (USFA), and others with fire safety education materials.[4]

Implementation Strategy 4 – Distribute catalog of public education materials.

As has been discussed by the WUI Advisory Group, the agencies (through NWCG) should produce a catalog to be printed and distributed, perhaps through the NFPA. Similar efforts should be made through partnership with the U.S. Fire Administration.

Fire Program Budgets

The reality of reduced budget levels, downsizing, and costs rising faster than budgets can have subtle but insidious effects on firefighter safety if proper precautions are not taken. Cutting corners in training, equipping, and supporting firefighters will lead to disastrous results eventually. Also, as preparedness budgets of some agencies remain high relative to budgets of other program areas, there is a tendency to allocate more indirect costs against fire accounts, further eroding the capability to deploy an effective and safe fire organization.

The external pressure to reduce the size of organizations produces the undesirable cumulative effect of continually reducing and diluting the experience level of firefighters.

Another external force compromising the safety of firefighters has to do with the environment in which they work. The safety of firefighters and the general public is being threatened like never before due to what some call a "forest health crisis" that has produced large accumulations of fuels and a greater likelihood for higher intensity fires. (The forest health problem includes increased insect infestation and disease, much deadwood, overgrown forests where natural fire has been excluded for decades, and changes in the mix of species.) Measures

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[4] Progress has been made toward this use of the Internet for something similar to what is recommended here. As of March 1998, a BIA computer specialist has been assigned to be webmaster for a computer site resident in F&WS that will provide a static page for the public, and an interactive (password controlled) page for agency personnel, for access to fire safety information and reports.

to reduce the threat to people from high intensity fires by improving the health of forests has significant budget implications as well.

Ironically all of these budget-related issues are cast in the shadow of the largest outlays ever made by Federal agencies in emergency firefighting funding in the 1990s. In 1994, for example, over 3 million acres were burned by wildfires on Federal lands, costing agencies one billion dollars in suppression costs. Newspaper editorials across the West were asking pointed questions about how this enormous outlay of money was helping citizens – as the fires seemed to be getting bigger and bigger that summer and the toll of firefighter fatalities mounted.

Obviously there is a need to define "the bang for the buck" that a given budget level entails. This definition should identify for the public a more balanced total fire management budget that better protects people, property, and natural resources. Fire prevention and hazard reduction need to become equal partners with the strong fire suppression program that has been in place for decades; and that equality needs to arise from a more equitable distribution of budgets among fire prevention, fire hazard reduction, and fire suppression programs. Encouragingly, major progress was made with the FY98 budget, which contained $83 Million taken from suppression funds for prescribed fires and fuel reduction, but there has not been a similar move for fire prevention.

Goal 85. Fire budgets and their allocation need to be set with an eye toward their implication for firefighter safety.

Implementation Strategy 1 – Fund the new safety initiatives.

The many recommendations in this report for improving safety obviously do not come free. Many of the changes can be made as part of the existing budgets, often at low cost or no cost. For example, making communications into a two way dialogue, monitoring fatigue, better distributing existing radios, promoting accountability and doing on-the-job training all have low or no incremental cost. However, many of the recommendations will require extra resources (e.g., establishing a fire safety incident reporting system, or a Center for Lessons Learned; revision of many courses; or starting a safety bulletin). Estimates obviously will need to be made of the cost of implementing the recommendations, and considered when setting priorities.

Implementation Strategy 2 – Get budgeteers to clarify the potential impacts of different budget levels, including the shift to do more prevention and hazard reduction.

It is important to establish the connection between a budget and the level of firefighting it will pay for. Defining the capability (or reduction in capability) associated with a proposed budget already is part of the process of developing budgets. However, an effort should be made to do an even better job of defining the "bang for the buck" that a given budget level entails. What the public gets for its money should be identified as well as what the public won't get. In particular, budget decisions need to be made in the light of how many large fires could be fought at one time. These should be compared to the expected number of large fires, and the shortfall acknowledged. The shortfalls should not be made up by cutting corners in firefighter safety. Safety has to remain a constant priority regardless of the budget level. For example, if funding for seasonals is reduced, the reduction should not come out of the minimum amount of training they need at the beginning of the season, as has sometimes been done.

A part of this strategy is to ensure that decision makers and the public begin to appreciate that more of the same as in the past is not appropriate in safeguarding the health and welfare of the public and firefighters. The natural environment has changed. It is time to make a major course correction in the manner in which agencies allocate fire management budgets. It is increasingly important to identify that public needs and firefighter safety are better served by a more balanced fire management program in the future.

Agencies should develop fire management budgeting strategies that more equitably allocate funds among fire prevention, fire hazard reduction, and fire suppression program elements. More funding support should go towards fire prevention and hazard reduction programs in the future than has occurred in the past. Two of the agencies (NPS and FWS) do not break out prevention explicitly in the formalized "FIREPRO" budget process; they need to change this, and to fully identify and integrate prevention programs in the budget process.

Budget trends under the new Federal Fire Policy are upward, especially for fire management. What is critical at this juncture is to redefine planning processes to include safety issues; they should not be dealt with ad hoc. There is an opportunity to move from planning for acres under flame to integrated analysis of prevention/education, fuels management, and control needs.

The reduction in the spendable part of the budget attributable to indirect costs (the pre-planned limit for non-production items – what is overhead in industry) needs to be considered as well as the total budget when considering impacts on firefighting resources and safety. The indirect costs have been escalating but are often not taken into account in assessing capability.

Implementation Strategy 3 – Inform firefighters and fire managers about the budget decision.

We found considerable cynicism among fire managers and those responsible for safety that, despite public statements, firefighters ultimately are asked to do the same job and follow the same strategies even when budgets and resources are cut.

To reduce cynicism and remove this major barrier to changing the culture will require leveling with the firefighters and letting them know the intent behind budget decisions. Building in a reporting link about new budgets back to the firefighters may achieve three things:

- Help prevent Agency Administrators or political decision makers from violating the intent of a budget, by making it clear that they would be reneging on a "deal" if they subsequently set the same requirements for the same number of fires with less resources.
- Reassure firefighters that attention to safety is serious, and that if cuts have to be made the firefighters are not going to be pushed beyond what is feasible with the remaining resources.
- Encourage fiscal responsibility with Agency Administrators ("plan the work; work the plan; charge as worked").

This feedback should be part of a deliberate policy to include employee participation in implementing change.

Implementation Strategy 4 – Modify the Fire Management Leadership course to reflect impacts of alternative budget strategies.

Disseminating information regarding the advantages of a more balanced fire management program should be done through the Fire Management Leadership Course at the National Advanced Resource Technology Center in Marana, Arizona. It should reflect the national leadership's important role in enacting such change, and the flexibility in allocating the budgets that Agency Administrators ultimately receive. At present the course is heavily weighted towards an Agency Administrator's reactive role in responding to a fire emergency, not towards

the more desirable proactive role of enhancing fire prevention and fire hazard reduction efforts prior to a wildfire. Firefighter safety would be well-served if the agencies increased emphasis on preventing a wildfire before it started, reducing hazardous fuels in advance of fire seasons, and restoring the ecological role of fire. Heightened awareness of these leadership responsibilities (with related re-focusing of resources) could begin to produce the necessary changes in budget allocations to accomplish more balanced programs on the ground. This recommendation also affects improving public education (Goal 83, 84) and prescribed fires (Goal 86).

Implementation Strategy 5 – Develop an interagency fire prevention strategy as input to budget.

An unwanted wildland fire that never starts is a wildfire that never exposes firefighters to risk. Although this truism is well understood at all levels, the fact remains that much more diligent attention is focused on fire suppression than on the real gains that might be made through implementing more progressive fire prevention programs. The excitement and appeal of crisis management is a major part of the organizational culture, and appears to many as more appealing than prevention activities.

A high-level interagency fire prevention strategy session should be convened to identify the latest innovations in fire prevention and to recommend budget levels needed to implement meaningful programs. A product of the session would be a Fire Prevention Strategy paper authorized by agency Fire Directors and distributed widely to fire management personnel highlighting the importance of relevant fire prevention efforts in ensuring the safety and welfare of both firefighters and the public. Fire prevention "success stories" also could be collected and distributed to field personnel to demonstrate the cost-effectiveness of appropriate fire prevention planning and implementation. The emphasis on prescribed burning and Fire 21 has moved the culture in this direction, and the proposed strategy session, if well-publicized, would move it even further.[5]

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[5] The FY 1998 Interior and Related Agencies Appropriation Act moved hazardous fuels management funding out of the fire preparedness function into a fire management operations account. This new budget structure should ensure that money is available to supervisors who are managing fire through prescribed fires and fuel treatment by providing a more flexible source of funding.

Fuel Build-up

The safety, health, and welfare of firefighters and the general public are becoming increasingly linked to the decline in the health of forested ecosystems. Fire exclusion practices and lack of adequate thinning and pest management over many decades have transformed many open-grown and fire-resistant forests on drier sites into fire-prone thickets plagued by insect and disease epidemics. Declining ecosystem health in many areas has greatly increased the vulnerability of firefighters and the public to threats from extreme fire behavior due to the excessive accumulation of fuel. Threats to human life are compounded by the fact that more and more people are building homes in the fire-prone forests, placing themselves and the firefighters who try to protect them at greater risk.

The efficacy of fuel hazard reduction strategies in combination with appropriate silviculture practices to reduce the intensity of subsequent wildfires has been demonstrated repeatedly. Still, it was somewhat surprising and gratifying that more firefighters surveyed in Phase I of this study chose *a long-range program of hazard reduction* as likely to make a larger difference in their safety than any other course of action. Agencies are faced with serious challenges in conducting hazard reduction projects on a large enough scale to significantly affect the fire behavior of future wildfires. Despite the obstacles, it is of paramount importance that agencies establish long-term fuel treatment strategies that create effective buffers of less flammable fuels that reduce fire spread rates and lower fire intensities.

Most agencies recognize that fire hazard reduction efforts of the past have been too small and too fragmented to provide any lasting improvement to forest health and firefighter safety. Most fire hazard reduction projects have been characterized by too little and too late; partly a function of being funded at only very modest levels. The severe nature of the threat to firefighters from fuel accumulation and the resulting high intensity wildfires has garnered the attention of all wildland fire agencies. Many have established fuel treatment priorities based on reasonable criteria and scheduled greatly expanded fuel hazard reduction projects.

Although agencies are taking positive steps to improve management of fire dependent ecosystems, numerous barriers still stand in the way of successfully reducing hazards through thinning, harvesting, fuel management, and prescribed fire. Many examples exist where agencies have demonstrated creative approaches in dealing with even the most challenging of external barriers like air quality constraints, but there continues to be a level of external resistance and internal inertia. However, things are changing. At the national level, wildland fire

suppression efforts traditionally have been better supported than mechanical hazard reduction and prescribed fire, but in FY 98, $83 million were available for these purposes. Agencies need to assess whether the level of budget support is likely to continue and be sufficient to accomplish the reduction of hazardous fuels within a reasonable time frame.

As a result of several severe fire seasons culminating in the disastrous 1994 season, the Agriculture and Interior Departments requested a comprehensive review of Federal wildland fire policies. The new Wildland Fire Policy reaffirms the protection of human life as the first priority in wildland fire management, and highlights the role of fire as an essential ecological process and natural change agent that must be reintroduced into the ecosystem. Where wildland fire cannot be safely reintroduced because of hazardous fuel build-ups or values at risk, various other forms of pre-treatment will be considered.

The Department of Interior estimates that 55 million acres require periodic treatment by fire. The Department of Agriculture has reported that unnatural, fire-prone forest conditions exist on 39 million acres, or 20 percent of the National Forest System. Policy changes to address the fuel accumulation problems on these high priority areas that have been identified include mechanical forest treatment, budget structure changes, new planning priorities, personnel training, new research, carefully planned prescribed fires, and many other initiatives.

It has taken seven or eight decades for the consequences of attempted fire exclusion on fuel accumulation to be fully realized. It will take just as long a period of time to restore the health of fire-adapted ecosystems. Fortunately the agencies are addressing this long-term need in their scheduling of treatment priorities. Interior agencies have projected an increase in acres treated from 298,000 acres in 1996 to 1,100,000 acres in 2001. This represents approximately a 25 percent annual increase over the next five years. In 1996, the Forest Service treated 532,000 acres and nearly one million acres were treated in 1997. By 2005 the Forest Service plans to treat 3.5 million acres annually. If this schedule is adhered to, by 2015 the Forest Service will have accomplished fuel hazard reduction on nearly all of the 39 million priority acres. The goal, then, is basically to continue the initiative to do this.

Goal 86. Improving forest health and removing accumulated fuels should be pursued to reduce the intensity of fires.

Implementation Strategy 1 – Consolidate diverse strategies into a cohesive plan.

Most agencies already have established priorities to identify and attack the most hazardous fuels, primarily the fuel complexes associated with short return interval fire regimes. The fire regimes in which historical fires were most frequent (those with fire return intervals of 1-25 years) have been most affected by fire exclusion practices of the past. A ponderosa pine forest, for example, that historically averaged a fire every 10 years may have been accumulating fuels over the past 70 years in the absence of fires. This fire regime has been altered to the point where the frequent low intensity surface fires experienced prior to 1900 have now been transformed into less frequent, high intensity crown fires due to unnatural fuel accumulations and lack of adequate forest management.

Some of the obstacles that must be overcome or questions answered in the implementation of the hazard reduction strategy are the following:

- The flammability of many forests is so high today that hazard cannot be safely reduced by prescribed fire alone. Thinning and commercial harvest often must precede prescribed burning to remove fuels and reduce tree densities, but many people object to cutting of any kind.
- The sheer magnitude of the immediate treatment priorities, 55 million acres for Interior agencies and 39 million acres for the Forest Service, is overwhelming.
- Although it is necessary to establish treatment priorities as the agencies have done, other, current lower priority fire regimes will pose threats to people as fuels accumulate over time. The Bureau of Land Management manages 272 million acres (much of it range land), and the Forest Service manages 191 million acres. Many of these acres that lie outside treatment priorities represent future high hazard problems as well.
- The actual impact of the new fine particulate smoke restrictions (PM 2.5) on prescribed fire practices has yet to be determined.
- There still is much less tolerance by the public for prescribed fire than there is for wildland fire problems. Suppression decisions are more risk-free (to decision-

makers) than prescribed fire decisions. The public does not yet fully understand the need for prescribed fire nor for thinning and timber harvest in managing fire-dependent ecosystems. (As noted earlier, the FY98 budget increased spending for prescribed fire and evidenced a growing understanding in Congress of the needs.)

- There is still a certain amount of inertia within the agencies that impedes initiation of large-scale fuel treatment programs, especially for prescribed fire because of its perceived risk.
- The agencies have not been especially successful in persuading developers and homeowners to assume more of the responsibility in solving the wildland/urban interface problem (hence Goal 83).
- The agencies need to work at seeking consensus among contentious publics to overcome the trend of decrying timber harvest and other land management priorities. Thinning and timber harvest comprise important parts of the solution in better safeguarding people from wildfires.

For each of the above obstacles there are examples across the country where managers have risen to the challenges and overcome the barriers in creative ways. In implementing the important hazard reduction strategy, it will be essential for agencies to consolidate the fragmented successes into a more cohesive and integrated plan of attack.

Implementation Strategy 2 – Consider using multiple funding options.

The magnitude of the fuel treatment program requires that a multiplicity of funding options be explored. As mentioned earlier, the Appropriations Act for FY 1998 moved hazardous fuel management funding into a more flexible fire management operations account. This will be helpful to managers, but funding opportunities for treatment need to be expanded beyond appropriated funds. There are some examples in the West where the harvest of small diameter material can pay the way for follow-up hazard reduction treatments. Agencies need to identify wood and fiber markets that will substantially improve commercial prospects for reducing the flammability of forests, though there have been environmental pressure groups opposing use of trees for commercial purposes.

Implementation Strategy 3 – Amend the National Environmental Protection Act to require consideration of firefighter safety.

The National Environmental Policy Act should be amended to require that firefighter safety (and public safety) be evaluated and provided for in the selection of land/resource management direction. There is a somewhat related precedent at the state level: The Washington state legislature has exempted prescribed fires designed to restore forest health from restrictions that stem from the Clean Air Act. Thus, the state legislature is providing expanded opportunities for prescriptive burning to improve the health of forests in eastern Washington.

Summary

This chapter on external influences addressed public fire safety education, fire program budgets and fuel build-up. The next chapter gives the project team's recommendations on priorities across all goals, and the next steps needed to implement them.

CHAPTER 7. SUMMARY AND STEPS FOR GOING FORWARD

This chapter summarizes the recommendations and some of the immediate steps to take to implement the recommendations of this report. Some longer-term considerations for changing the culture of wildland firefighting are also discussed.

Despite the large number of goals and the even larger number of suggested implementation strategies we presented here, ***the Federal interagency wildland firefighting program has done remarkably well, and currently has many more strengths than problem areas***. In going forward, it is important to remind everyone from firefighters just coming into the program to top leadership that the recommended changes build on a successful national interagency program with excellent inter-governmental linkages. The vast majority of the 1,000 firefighters interviewed or surveyed did not think that a revolution was called for, but rather that there was a need to solve a variety of specific problems that are not surprising in as large and complex a human undertaking as wildland firefighting.

Outside sociologists and psychologists brought in to examine the wildland firefighting program and the wildland firefighting community found them quite remarkable. Going forward with the recommendations presented here to change the organizational culture will be another extremely positive aspect of the wildland firefighting program – that it willingly identified its problems and continues to improve over time.

Still, as noted in the report *Course to the Future: Positioning Fire and Aviation Management,*[1] "Despite having widely known safe-practice procedures, access to an advanced fire behavior prediction system, required personal protective equipment, and an established firefighter safety training program, 34 people lost their lives across interagency jurisdictions in 1994." That honest assessment illuminates a critically important issue: that espoused policy only becomes effective policy when it produces the behavior desired of people. To affect change, United States firefighting agencies need fireline safety policy that enjoys a great deal of consensus and field support, manifesting itself as behavior on the fireline and at various levels of leadership. We found that many safety problems came from a failure to implement existing policies, more than a need for new policy. In some cases the problem is a lack of awareness or understanding of the policy.

Setting Priorities

It is difficult to set priorities among the various recommendations made for two major reasons: there is a lack of adequate data on the frequency of occurrence of the various underlying factors that lead to firefighter fatalities, injuries, and near-misses, and the various factors are highly interrelated. Further, there is often a chain of events leading to fatalities or serious injuries, and the various links in the chain are often not documented. It is difficult to say whether attention to fatigue, training for decision-making under stress, or closing of communication loops is the highest priority when one does not know the percent of fatalities or serious injuries in which fatigue was an element or a communications failure or poor decisions from leaders being "stressed out." Regarding interrelationships, we know that the pride and professionalism of the workforce affects retention, which in turn affects experience levels, which in turn affects abilities to make decisions under stress. Does one start with the existing leadership and put highest priority on decision training, or does one start with retention incentives that affects build-up of expertise? Ideally, one would like to do all of these things in parallel, and in fact, many of the most important strategies presented can and should be undertaken in parallel. But someone has to decide on what things to do first.

The Fire Directors must take the first major step toward implementation of the recommended strategies by deciding on their priorities.[2] As part of setting priorities, the reasonableness and validity of each recommendation needs to be considered. Some may already be in progress. Ideas for additional or alternative strategies to meet the goals should also be considered and prioritized.

At the end of this chapter, in Table 7-1, we have listed all of the goals and associated implementation strategies, and our own ratings of the priority of the recommendations. We used the following rating scale:

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[1] Op. cit.

[2] The goals themselves already have been approved as part of the Phase II process. In reviewing them for Phase III, none were dropped. A few had small wording changes, and several were found to be redundant or close enough to others to be viewed together as a cluster of two or three goals; and one was added for clarification (Goal 50).

Priority 1. Critical, essential, highest priority recommendations for improving safety.
Priority 2. Highly important for improving safety.
Priority 3. Important or desirable for improving safety.

Something that is critical to safety but generally being done well was given less priority than an area where a large improvement is needed. For example, transporting injured firefighters is of critical importance, but it seems to be done well in most cases, and is therefore not given a "1" rating. The priorities in the table indicate which ones, in our opinion, are most important to start doing first, not necessarily those factors most important in the abstract. Many good things are happening already to improve safety; one needs to flag the things that need the most attention to make further progress, or to prevent increasing risk. Many of the decisions about priorities were difficult – there is a tendency to label everything as critically important. Most of the recommendations will improve safety. If we did not think a recommendation was important we would not have included it in the report at all. The items discussed in the Executive Summary were the ones we felt would make the most significant difference in affecting firefighter safety.

The five agencies' fire programs are extremely dynamic and continually evolving. We have tried to reflect a reasonably current status of the existing programs in making recommendations, but there may be cases where there was progress we did not hear about or initiatives already planned to meet some of the same goals. Final priorities set by the agencies should of course reflect the latest information.

Developing an Assignment Matrix

After determining the priority of each implementation strategy, we recommend that the Fire Directors develop an assignment matrix. For each implementation strategy, this matrix would list a) the person or unit or working group responsible for implementation and b) milestones and a date to complete. Implementation strategies that require non-trivial funding need to be worked into agency budgets. The table at the end of this chapter provides a starting point for the matrix, but milestones and assignees need to be added.

Appointing a "Hound Dog" or "Champion"

Our past research into successful fire prevention programs found that in virtually every case there was a "champion" or "sparkplug" who tenaciously fought for the project and stuck with it through implementation.[3] Since the implementation here requires starting many efforts, there needs to be a "champion" for each task and an overall champion or "hound dog" to track the set of tasks and monitor progress of the whole program. The final phase of this project is planned to do part but not all of this job.

An individual or unit within or outside the agencies needs to be appointed to periodically (e.g., at least quarterly) contact the person or unit given responsibility for each implementation strategy and report on the status of that strategy. An overall status report should be sent on a regular basis to the Fire Directors, with red flags provided for projects that do not seem to be moving according to schedule – especially for those considered highest priority. The "hound dog" aspect of the reporting function would help ensure that implementation proceeds by maintaining continued interest (or even nagging!) about the status of each task, with the tacit understanding that it was going to be tracked at the highest level. The key is not the reports but the active interest and follow-up, and the knowledge that the level of progress will be publicized.

The "hound dog" should be put in the loop of relevant memos, reports, and significant correspondence issued by the task assignees for each implementation strategy. The assignees would know that someone was monitoring their work to see if there was action, and if necessary that they would be receiving a call if there was no visible progress.

There are various project management software packages that are well suited for showing milestones and project status graphically for a large number of interrelated tasks. Such a graphic display may be helpful to the fire directors to track progress.

Dissemination of Study Results

Dissemination of this report itself will be important both to establish widespread understanding of what is being recommended and to demonstrate that there has been much follow-up to the inputs obtained from 1,000 firefighters. This dissemination should

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[3] P. S. Schaenman, et al, *Proving Public Fire Education Works*, TriData Corporation, Arlington, Virginia, 1990.

help motivate people at various levels to participate in the implementation. The dissemination of the findings needs to proceed along several paths.

As was done with the Phase I and Phase II reports, this Phase III report should be made available to anyone interested in it; a large number of copies should be disseminated. The agencies should inform their firefighters and fire managers of its existence, and make it available on the Internet, as was done with the Phase I and II reports.

But a crucial difference between this phase and the preceding ones needs to be considered: many highly energetic managers at various levels will read the report, see ideas they like, and start implementing them. This reaction generally should be encouraged, publicized, and even rewarded. However, for any implementation strategies thought not to be viable, or recommendations with which the fire directors do not concur, or strategies already started, a note to that effect needs to be sent out along with the report, so that no one starts working on something that is not considered a good idea or that is not consistent with other plans or policy, or that would be a redundant effort. Disseminating the implementation plan will be even better toward these ends.

In addition to making the report itself available, the dissemination methods used in previous phases should be expanded. A summary of the results should be presented at selected wildland firefighting and Agency Administrator conferences and meetings. In 1998 the Fire Directors have had the recommendations of this report discussed by the project team at two of their meetings (in January in Boise, and in February in San Antonio). In the previous phases, the project study team gave presentations at selected meetings and developed overheads that were used by others to give presentations at their own meetings. We suggest the same approach be continued, but with even greater dissemination of the recommendations once the Fire Directors determine the priorities and assignments for implementation.[4]

We also recommend issuing a press release and articles on the findings and recommendations of the study for dissemination not only through the internal agency

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[4] A meeting is planned for May 1998 in Boise to decide on the implementation approach, as this report was being completed.

distribution mechanisms, but also externally through major fire world publications and on the Internet. Many of the ideas developed for the Federal wildland firefighting community in this report have application to state wildland fire organizations and to the local fire service.

Because the report is voluminous, some summary versions need to be available. The Executive Summary, perhaps coupled with the short Introduction and Methodology chapters, including the list of goals and implementation strategies summarized in this chapter could be the core for press releases or for quick dissemination of results in lieu of an article.

Integration of Management and Workforce

As stated in Chapter 2 (Methodology), the culture must change from both ends, top and bottom. Recommendations for improving the safety aspects of how work is conducted must first involve the firefighters themselves. Then the changes must be championed by management vigorously, visibly, and vocally. The implementation process must involve both, or cultural change cannot occur.

In this project, ***the starting point*** was involvement of the workforce. Over 1,000 firefighters were either interviewed in person or surveyed with a detailed comprehensive questionnaire, including open-ended questions to which hundreds provided written ideas and opinions. The set of issues that emerged from this large sample of the workforce drove this project. Furthermore, we solicited not only problems, but also solutions. The extraordinary breadth of this study came from the multitude of issues raised by the 1,000 firefighters, and the many solutions they proposed.

So how do you get everyone involved in the implementation?

The first step is to create widespread awareness. As recommended above, get the reports on the Internet and make sure people know about it. Get lots of copies out into the field and into people's hands. Send a news release or articles to every fire publication and agency newsletter, including *Fire Management News & Notes, Wildfire, Wildland Firefighter, Journal of Forestry, NFPA News, American Fire Journal.* Conduct "roll-out" meetings for the Fire Directors (FFALC), FFAST, NWCG, all GACGs, and the field (sponsored by GACGs) where people are formally and systematically introduced to the goals, the strategies, priorities, assignments, resources assigned, and target dates, and

given the opportunity to ask questions, get clarification, express their opinions, and provide input. Orient and train "circuit riding champions of the cause" and turn them loose to brief people at all levels of the organizations (districts, forests, refuges, etc.). As the saying goes, from awareness comes appreciation, from appreciation comes understanding, from understanding comes commitment and action.

That initial surge of dissemination must be the start, not the end of the workforces's involvement. The agencies need to keep the workforce involved in the implementation of the recommendations. Solicit input through workshops, conferences, meetings, and questionnaires. Give lots of important assignments to the field and to "interest groups" such as regional Hotshot steering committees, smokejumpers, GACGs and their zones. Demand accountability and make sure that the strategic direction permeates every aspect of these people's work life (work planning priorities/targets, budgeting, performance evaluations, merit system promotions, awards, bonuses, raises, etc.).

To achieve a managed risk environment, people must pull in the same direction on policy, procedure, strategy, tactics, and what constitutes acceptable behavior for individual firefighters. That unity of purpose and direction requires a great deal of consensus across agency, cultural and sub-cultural lines. However, by nature, people do not commit to the determinations others make for them. Widespread commitment to organizational change demands the vigorous and systematic involvement of the people expected to carry out change. With firefighter safety, this involvement should occur through an organized, methodical process that encourages employees at all levels of all agencies to influence strategic issues. A culture of firefighter safety excellence will result from widely held attitudes. Attitudes will be the result of widely observed behavior. Behavior will result from a consensus on, and commitment to, the strategic goals documented by the firefighter safety awareness study.

Personal Actions by Fire Directors and Other Top Management

The Fire Directors and their senior managers personally have a critical and personal role to play in seeing that change occurs, and in determining how fast it occurs. It will take several years, perhaps as many as five to ten years, to implement the various changes in organizational culture, leadership and human factors recommended here, even if there is widespread agreement on the recommendations. Thus, there also is a need for patience.

Our specialists in organization change, drawing on real-world examples and on research from sociology and psychology, strongly recommend that the fire leadership take numerous incremental steps to help change the culture. The culture will not change by putting out an edict that says, "New safety program starts Monday morning." Cultures don't change that way. Rather, the leadership needs to start a variety of specific implementation strategies. They need to show continued interest in safety by asking questions about the safety implications of programs that they are dealing with day to day. They need to praise individuals who have made contributions to safety, and provide critical marginal notes or other types of comments on various letters, memos, and reports they see that either do not address safety when they should, or take a step backward.

Many researchers have found that workers stay aware of what is truly important in their organizational culture not by what is given lip service, but by what is continually the subject of reward or penalty, and what is continually on the minds of the leadership. Safety becomes a part of the culture not so much when it is not discussed as a separate program, but rather when it is something that is paid attention to continually. Therefore, we recommend against presenting the changes here as a major safety campaign, but rather many changes should be started, letting the actions speak for themselves. The leadership also should connect these actions to the starting point – the comments from all levels of the workforce.

Key ideas on the role of leadership in making change happen are discussed in a paper produced as part of this project for the January 1998 meeting of the Fire Directors by a member of the project team, Dr. Charles Perrow, Professor of Sociology at Yale University and a specialist in safety of complex organizations.[5]

Tracking and Evaluation

The final phase of this project, Phase V, is to be a periodic tracking of progress made in changes in the organizational culture, leadership, human factors, and attitudes about safety.[6] An initial set of performance measures was developed in Phase II that can be used for this tracking, after review and modification to reflect the implementation plans. The evaluation of impacts of the recommended changes are not the same as the

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[5] Perrow, op cit.

[6] For those familiar with the past numbering of phases in this project, note that old Phase IV (evaluation of progress) has been renumbered Phase V, and a new Phase IV added to assist with implementation.

"hound dog" function above, though the two functions are complementary and can be incorporated in one organization that would both monitor whether milestones were being met, and also periodically evaluate the impact.

Concluding Remarks

Many of the changes necessary to improve safety recommended in this report are relatively straightforward and do not cost much to implement. Others require modest expenditures, e.g., to develop course materials or start on-the-job training. Some require higher expenditures (e.g., new technology for aerial observation, "smart" Red Cards, safety data system, etc.). Some of the changes recommended here can be undertaken by the existing organizations without major impacts on their budgets. Many recommendations will require some additional expenditures to change the fire safety culture as desired, and save firefighters' lives.

If the men and women of the Federal wildland firefighting community help implement the many recommendations discussed here that originated from problems and solutions they identified, the wildland firefighting program will not only continue to be an exemplary national effort, but a much safer one at that.

TABLE 7-1. SUMMARY OF PRINCIPLES, GOALS AND THEIR PRIORITY RATINGS AND IMPLEMENTATION STRATEGIES

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
ORGANIZATIONAL CULTURE		
Principle – Preserve strength of current system.		
Goal 1. The existing strengths of the Federal wildland firefighting system should be preserved and built upon.	*2*	
IS 1 – "Physician Do No Harm." Evaluate proposed strategies and changes to avoid unintentional negative side effects.		2
IS 2 – Disseminate information on what is perceived to work well.		2
IS 3 – Fix the existing system first.		3
Principle – Collect reliable safety data and use it.		
Goal 2. A "Code of Conduct" should be established in which employees should have both the right and obligation to report safety problems, and to contribute ideas on their safety to supervisors. The supervisors are expected to give the concerns and ideas serious consideration.	*1*	
IS 1 – Disseminate directives – and otherwise spread the word – that each person is expected to report safety problems and to contribute potential solutions.		1
IS 2 – Train new firefighters to speak up about safety.		1
IS 3 – Train supervisors to listen.		2
IS 4 – Include the raising and handling of safety comments in performance ratings and accountability systems.		2
IS 5 – Involve employees in developing ways to get these ideas implemented in the field.		1
IS 6 – Promote a single code of conduct (including the reporting of safety incidents) across agencies.		2
Goal 3. Every employee is expected to report a) injuries (and of course fatalities), b) entrapments/shelter deployments/burnovers, and c) near misses.	*1*	
IS 1– Develop a common interagency reporting system.		1
IS 2 – Incorporate basics on safety reporting in training courses.		2

[7] Priority ratings are given in terms of the importance for change from the current situation, not the absolute importance of the goal or strategy. The ratings are: 1 – Critical to change or improve, 2 – Highly important to change or improve, 3 – Important or desirable to change or improve. Some very important subjects (e.g. transport of injured firefighters, or the need to be sober) were given lower than "1" ratings because of having less of a need to change from where they stand today than was the case for other issues.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 4. The five agencies should strive to obtain a clear, quantitative picture of the pattern of safety incidents, their causes, trends, and the lessons learned; and to identify potential problems at the earliest time possible.	*1*	
IS 1 – Analyze and publish safety data.		1
IS 2 – Establish a safety-oriented Center for Lessons Learned.		1
Goal 5. All wildland firefighter fatalities should be investigated in a consistent manner to glean lessons for averting future fatalities.	*1*	
IS 1 – Develop interagency protocols for the process and substance of investigations.		2
Principle: Promote accountability for safety at all levels		
Goal 6. Individuals at all levels should be held accountable for safety violations.	*1*	
IS 1 – Start policy of removing safety violators from the job.		1
IS 2 – Follow-up on reported safety infractions.		2
IS 3 – Consider safety performance in performance reviews and promotions.		1
IS 4 – Add training in accountability.		2
IS 5 – Include accountability in operational guidelines.		2
IS 6 – Provide guidelines for accountability.		2
Goal 7. An individual or Crew Supervisor should have the right of refusal to pull themselves or their crew out of what they perceive as undue danger.	*2*	
IS 1 – Train firefighters on the process to use, not just the right.		1
IS 2 – Monitor frequency of refusals.		3
IS 3 – Head off situations in which refusals are necessary.		1
Goal 8. Foster a sense of individual responsibility for safety actions.	*2*	
IS 1 – Include in the 'code of conduct' that all employees are responsible for adhering to safe practices and correcting violations.		1
IS 2 – Discuss the issue of responsibility in initial training and in refresher training.		2
IS 3 – Disseminate examples and stories of successful individual initiatives.		2
Principle – Promote safety for all who work at Federal fires		
Goal 9. The safety goals and rules should apply to all firefighters working at a wildland fire which is a Federal worksite.	*1*	
IS 1 – Require, encourage, and assist non-Federal agencies to comply with safety precautions.		1
IS 2 – Provide (or facilitate obtaining) training and equipment for non-Federal firefighters who assist.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 10. The rights and responsibilities of wildland firefighters should apply to all, regardless of race, gender, ethnic affiliation, or employment status.	*1*	
IS 1 – Ensure that all of the recommendations here are applied uniformly for all types of firefighters.		1
IS 2 – Ensure equitable equipping and treatment of Type II crews.		
IS 3 – Provide opportunities for verbal communications training.		3
Principle – Rebuild the level of experience.		
Goal 11. Adequate experience levels are needed for Crew Supervisors and higher positions. There is a minimum cadre of experienced personnel needed for each supervisory level of the fire program.	*1*	
IS 1 – Periodically develop strategic assessments of personnel needs.		1
IS 2 – Track experience levels.		2
IS 3 – Establish an apprenticeship program.		2
IS 4 – Revise requirement for currency of certification.		2
IS 5 – Increase the use of special assignments to build experience.		3
IS 6 – Encourage more participation from non-fire personnel.		3
Goal 12. Encourage the retention of permanent employees on fire duty.	*2*	
IS 1 – Remove pay caps for overtime on fires.		2
IS 2 – Consider expanding use of special pay and retirement incentives for collateral duty personnel.		3
IS 3 – Increase expectations for employee participation in fire programs.		2
IS 4 – Evaluate employees' willingness to participate in fire programs.		2
Goal 13. Encourage retention of seasonals on fire duty.	*1*	
IS 1 – Re-examine personnel policies that inhibit retention of seasonals.		2
Goal 14. Develop ways to use training of various types to compensate for lack of experience.	*1*	
IS 1 – Expand use of on-the-job training; train people how to do it.		1
IS 2 – Enhance course training in strategy and tactics.		1
IS 3 – Develop family of simulators and other instructional technology.		2
IS 4 – Develop a family of simulations.		2
IS 5 – Use more visual, interactive multimedia training.		2
IS 6 – Prepare for out-of-region experience.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 15. Ensure that individuals and crews in low fire incidence areas have the opportunities for experience in other areas, and/or have adequate oversight when sent to different or complex situations.	*3*	
IS 1 – Provide opportunities to work in high incidence areas.		3
Principle – Ensure the integrity of the certification and qualification system.		
Goal 16. Certifications (e.g., Red Cards) should be meaningful indications that a person is ready to take on the requirements of the job they are certified for.	*1*	
IS 1 – Better explain the intent of the system and its requirements.		1
IS 2 – Train managers better on implementing performance – based certification.		2
IS 3 – Revise Position Task Books if necessary.		2
IS 4 – Use key tasks from the Position Task Books in performance evaluations.		2
IS 5 – Toughen currency requirements.		2
IS 6 – Make training required (versus "suggested") to achieve qualifications.		2
Goal 17. Signing off on Red Card credentials without reasonable evidence that the person has met all of the requirements should be a punishable offense.	*2*	
IS 1 – Educate and build confidence about the system.		2
IS 2 – Utilize disciplinary actions when appropriate.		1
Goal 18. Credentials should be reviewed for all resources before the resources are utilized.		
IS 1 – Revise ICS training materials regarding check-in.		2
IS 2 – Motivate the check-in recorders concerning the importance of their role.		2
IS 3 – Develop "smart" Red Cards that allow quicker, more accurate check-in of individuals.		2
IS 4 – Ensure that IMT training stresses the need to consider and share information on the status and certification of crews at check-in.		3
IS 5 – Ensure equality of review across positions.		3
IS 6 – Evaluate acceptance level for insignia.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Principle – Communications must be clear and understood.		
Goal 19. One-way communication should be replaced by two-way dialog. People at each level of the fire hierarchy should be comfortable with requesting clarification of information, or requesting additional information. There should be no stigma attached to requesting clarification; it should be considered professional to do so.	*1*	
IS 1 – Start training in interpersonal communications with the very first Firefighting training, and expand the training to include the new concepts Presented here.		
IS 2 – Require formal acknowledgments, especially in radio communication.		1
IS 3 – Legitimize and encourage the asking of questions.		1
IS 4 – Use multiple means to convey the cultural change.		2
IS 5 – Establish communications protocols for tactical operations.		2
IS 6 – Use Crew Resource Management (CRM)-like training.		1
IS 7 – Change the dialogue on the fireline through on-the-job training and examples provided by supervision.		1
IS 8 – Provide instruction on use of radios and radio discipline.		1
Goal 20. Information needed for safe operations and warnings should be transmitted up, down, and laterally within the organization at an incident, (with positive feedback that the information is received and understood, as discussed in Goal 19.)	*1*	
IS 1 – Improve the quality of briefings at incidents.		1
IS 4 – Develop and use checklists for transmission of information.		3
Goal 21. Dispatchers are key nodes in the communication system and must be well-trained, well-informed during the incident, and must not exceed their authority.	*2*	
IS 1 – Train dispatchers in the new approach to communications dialogue and in their role as change agents.		2
IS 2 – Improve recruiting and initial training of dispatchers.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Principle – Provide firefighters with safe and adequate protective gear, tools, equipment and transportation.		
Goal 22. All firefighters (on Federal fires) must be equipped with the personal protective equipment needed for their job (and the training to use it).	*1*	
IS 1 – Broadcast and enforce minimum standard for radios and personal protective equipment.		1
IS 2 – Prepare for equipping non-Federal firefighters at incidents.		2
IS 3 – Support funding for state and local fire units.		3
IS 4 – Reinforce policy on carrying shelters.		2
Goal 23. Every crew should have a continuous communications link to incident management and to nearby crews; this means having at least two radios in good working condition per crew.	*1*	
IS 1 – Improve distribution of radios, batteries, and other communication equipment.		1
IS 2 – Establish new caches if necessary.		3
IS 3 – Mandate radios for each squad.		1
IS 4 – Assure adequacy of radios for mobile resources.		1
Goal 24. The communications system used at fires needs to provide adequate channels, adequate clarity, and adequate reliability for communicating with all fire personnel, aircraft, and IMTs.	*2*	
IS 1 – Periodically re-evaluate and improve communication channel capacity and reliability.		2
IS 2 – Move some of the communications load off the radio.		3
Goal 25. There should be accountability for keeping equipment well-maintained.	*3*	
IS 1 – Describe equipment maintenance responsibility in basic courses.		3
IS 2 – Review and revise if necessary the qualifications of equipment specialists.		3
IS 3 – Hold users and cache operators responsible.		3
Goal 26. Situational awareness should be improved by improving the ability of Crew Supervisors, Incident Management Team, Incident Commanders and above to obtain overhead views of the fire, including data from infrared and possibly other sensors.	*1*	
IS 1 – Use satellite imagery.		2
IS 2 – Use real time air-to-ground and ground-to-air video.		1
IS 3 – Use aerial drones.		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 27. Crews, teams, and individuals should be transported where needed with attention to net risk reduction and with consideration of reducing fatigue.	*1*	
IS 1 – Give more weight to risk reduction, especially reduction of fatigue.		1
IS 2 – Explore use of safer ground transportation.		2
IS 3 – Use computerized transportation scheduling.		3
Goal 28. All transportation drivers should have adequate experience and training.	*2*	
IS 1 – Increase requirements and realism for training of bus drivers and other drivers.		2
IS 2 – Hold drivers accountable.		2
Principle – Provide quick, high quality care for the injured.		
Goal 29. Injured firefighters should be speedily rescued.	*2*[*]	
IS 1 – Appoint a task group to review evacuation procedures and associated paperwork, and consider a model evacuation plan.		3
IS 2 – Reduce evacuation needs by improving on-site care.		2
LEADERSHIP AND FIRE MANAGEMENT[*]		
Principle – Assure leadership is qualified and well-trained.		
Goal 30. Set firefighting goals commensurate with available resources.	*1*	
IS 1 – Use the "Wildland Fire Situation Analysis" approach or others to evaluate fire control strategies and select the best commensurate with available resources.		2
IS 2 – Encourage regional and national fire managers to be more flexible and to revise priorities in real time during a season, when necessary.		1
IS 3 – Provide adequate fire management training to Agency Administrators, and encourage them to exercise more discretion to enhance safety.		1

[*] To repeat a previous note: this is a highly important goal but not rated "1" because it is largely being done and in less need of improvement than other goals.
[*] Also related are goals on situational awareness.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 31. Do not fight fires in a way that will endanger firefighters, regardless of the values to be protected.	*1*	
IS 1 – Ensure that this goal is emphasized in strategic and tactical fire courses.		2
IS 2 – Do not allow constraints on firefighting approach due to ecological considerations to interfere with safe protocols.		1
IS 3 – Do not permit structural firefighting by firefighters not trained for it.		2
Goal 32. The strategy and tactics of fighting a fire must be flexible and periodically reconsider the available resources and the changing situation.	*1*	
IS 1 – Train and evaluate fire managers in being flexible and readjusting strategy and tactics as needed.		2
Goal 33. Long-term fire growth assessment models should be used in making decisions on fire management strategy.	*2*	
IS 1 – Prepare ahead of time for use of models.		2
IS 2 – Use fire growth models in real time to establish priorities.		3
Goal 34. Define adequacy of safety zones by terrain type, fuel type, and fuel condition.	*2*	
IS 1 – Publish a "job aid" (concise notes) on sizing safety zones.		2
Goal 35. Assure that safety is adequately considered as transitions are made from initial attack to extended attack, from extended attack to Type II IMT, from Type II to Type I IMT, and back from IMT to local unit.	*1*	
IS 1 – Emphasize the safety aspects of handling transitions in various command courses.		1
IS 2 – Develop checklists for each of four levels of transition.		2
Goal 36. Where appropriate, in areas designated for aggressive attack, more fires should have a rapid initial response when they are small, if resources are available (and when the potential for spread and the values to be protected are a concern).	*2*	
IS 1 – Get employee buy-in at all levels for use of more vigorous initial and extended attack.		2
Goal 37. To prevent information overload and allow flexibility, the fire orders should periodically be screened to identify the minimum essential set, and that should be rigorously enforced.	*2*	
IS 1 – Conduct a content analysis of the various guidelines and produce a reduced set.		2
IS 2 – Re-define which are truly orders and which are guidelines that can be modified under special circumstances.		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 38. Fire safety practices should be driven by a systematic risk assessment that gets updated periodically.	*1*	
IS 1 – Adopt a comprehensive risk management approach to firefighter safety.		1
IS 2 – Establish and cultivate a culture that encourages people to think, make effective decisions, and place a priority on firefighter safety.		1
IS 3 – Incorporate the risk management concept in training.		1
Goal 39. The list of Watch Outs needs to be integrated into training and decision-making, and their role as warnings emphasized.	3	
IS 1 – Clarify the use of the Watch Outs in training.		3
Goal 40. Workable spans of control should not be exceeded at any level of management, especially not by Division and Group Supervisors.	2	
IS 1 – Encourage flexibility in establishing and subdividing divisions when appropriate.		2
IS 2 – Reaffirm ideal span of control.		3
Goal 41. Develop and use criteria for determining when night operations would be safe and effective. Acknowledge that, depending on circumstances, night operations are a tool that may enhance safety or may increase risk.	*2*	
IS 1 – Develop a job aid or set of criteria for deciding when to use night operations, and when not to.		2
Goal 42. Fire experience and competency should be considered as critical selection factors for fire leadership and fire management positions.	*1*	
Goal 43. All personnel in a given position must meet the performance requirements of that position.	*2*	
Goal 44. Fire management officers (FMOs) must be selected from among those with fire backgrounds.	*1*	
IS 1 – Set and enforce minimum requirements for key leadership positions.		1
IS 2 – Require fire experience for the FMO position.		1
IS 3 – Review incumbents who do not measure up, and reassign or retrain if appropriate.		2
IS 4 – Require Fire Management course for FMOs or their equivalent.		2
IS 5 – Give fire management training to all Agency Administrators with fire program responsibilities.		2
Goal 45. Those in sensitive command functions should have relatively fresh or updated experience.	*2*	
IS 1 – Require more recent experience (or equivalent training exercise).		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 46. Crew Supervisors should be selected not only for technical knowledge and experience, but also for their leadership skills, interpersonal communications, and ability to conduct on-the-job training.	*2*	
IS 1 – Develop a "multi-source assessment" center approach to selecting supervisors.		2
IS 2 – Stiffen other requirements for Crew Supervisor.		3
IS 3 – Train supervisors and/or candidates for supervision on how to conduct on-the-job training.		2
Goal 47. No one should be allowed to set fire strategy or tactics for a fire or give any operational orders without having adequate fire experience, or training considered reasonably equivalent.	*2*	
Goal 48. Agency Administrators should have fire background, or strategic fire training (or delegate fire responsibilities to a subordinate with those qualifications.)	*2*	
Goal 49. The tone and substance of briefings by Agency Administrators should be conducive to and emphasize safety.	*2*	
IS 1 – Revise the fire-related competency requirements for Agency Administrators.		2
IS 2 – Give examples to Agency Administrators of critical safety problems they can affect in meeting with Incident Management Team.		2
IS 3 – Develop refreshers or quick-help approaches for Agency Administrators.		3
IS 4 – Develop an attitude and ethic of professionalism that encourages retention and promotes safety behaviors.		
Goal 50. Incident Commanders at all levels must be selected on the basis of leadership ability as well as technical competence.	*1*	
IS 1 – Develop criteria for Incident Commanders, especially Type 3-5.		1
Goal 51. The Safety Officer position responsibilities, priorities, and independence should be more clearly defined.	*3*	
IS 1 – Reexamine and clarify the role and organizational placement of Safety Officers.		3
IS 2 – Set higher selection standards for Safety Officers.		3

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 52. For extended attack (and larger) fires, someone needs to monitor operations to ensure compliance with established safety requirements, procedures, policies, and standards.	*1*	
IS 1 – Re-enforce the concept that everyone is responsible for monitoring safety.		1
IS 2 – Assign someone ad hoc to monitor safety during transitions when no Safety Officer is present.		1
Principle – Crews must not be pushed beyond their capabilities.[8]		
Goal 53. A method is needed to rate the capability (competency and condition) of a crew.	*2*	
IS 1 – Use a crew classification system of three or more levels.		2
IS 2 – Consider sub-types within a type of crew, especially for Type II crews.		3
IS 3 – Consider developing a smart "resource card" for fast check-ins.		2
Goal 54. The condition and competency of crews needs to be considered when making assignments.	*1*	
IS 1 – Require those who make crew assignments to consider the status as well as type of each crew (and other resources.)		1
Goal 55. Crew Supervisors must accurately report the status and competency of their crews.	*1*	
Goal 56. The equipment of crews should be reviewed and taken into consideration when giving them assignments.[9]	*1*	
IS 1 – Require Crew Supervisors to accurately describe the status of their crew at check-in. (The same applies to other resources.)		
IS 2 – Require Crew Supervisors to describe any equipment problems at check-in. (The same applies to other resources.)		1
Principle – Continue development of integrated, intergovernmental, interagency system.		
Goal 57. Further improve Federal-state-local interagency coordination.	*2*	
IS 1 – Expand official or ex-officio representation of local fire agencies on NWCG.		2
IS 2 – Further develop coordination with "GACGs."		3
IS 3 – Ultimately develop a nested set of interagency organizations.		3

[8] See also Goal 6-17, on fatigue.

[9] In a few places, such as here, two or three related goals are grouped together, with one set of joint strategies for implementing them.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
HUMAN AND PSYCHOLOGICAL FACTORS		
Principle – Develop an attitude and ethic of professionalism that includes safety and encourages retention.		
Goal 58. Firefighters need to maintain an appropriate psychological balance, avoiding the extremes of paralyzing fear of the danger, unawareness of the danger, or overconfidence/complacency/denial.	*1*	
IS 1 – Promote the image of a well-balanced professional firefighter as a role model.		1
Goal 59. Recognize and promote the image of the professionalism of wildland firefighters.	*1*	
IS 1 – Define the concept of being a professional firefighter.		1
IS 2 – Refer to firefighters as firefighters, regardless of their job series.		2
IS 3 – Expand firefighter duties to include prescribed fires.		1
IS 4 – Expand other job duties and cross-training among lower-level firefighters.		2
IS 5 – Increase the autonomy of firefighters to adapt to conditions.		3
IS 6 – Develop a larger corps of professional firefighters.		3
IS 7 – Expand cross-training of a core group of firefighters.		2
IS 8 – Promote the concept of a professional "attitude of wisdom."		1
Goal 60. Maintain a zero tolerance policy for substance abuse at fires (including bases and camps).	*1*	
IS 1 – Enforce the existing policy.		1
IS 2 – Provide education on the policy and the need for zero tolerance.		2
IS 3 – Include alcohol and drug testing for fatalities and serious injuries.		2
IS 4 – Include being sober and drug-free as part of professionalism.		3
Principle – Maintain situational awareness.[10]		
Goal 61. Do what it takes to achieve and maintain situational awareness at each organizational level.	*1*	
IS 1 – Teach techniques for maintaining situational awareness in training courses from firefighter to Incident Commander.		1

[10] This also is related to well-trained leadership.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 62. Good communication is needed between crews working in proximity, especially one above the other.	*2*	
IS 1 – Mandate that crews and division supervisors be informed of the location of crews near each other.		2
IS 2 – Keep crews working at different elevations near each other in radio contact and informed of each other's plans.		2
Goal 63. Take extra safety measures in drought years.	*2*	
IS 1 – Activate regional interagency Fire Behavior Service Centers during drought years to increase available information and raise awareness.		2
IS 2 – Use other, less formal ways to keep firefighters informed about conditions.		2
Principle – Realistic, high quality training must be used to compensate for lack of experience.		
Goal 64. Training should be available, high quality, and consistent.	*1*	
IS 1 – Develop a needs-based strategy for training across agencies (i.e., matching training availability to the quality and quantity of training needed).		1
IS 2 – Develop a common approach to certifying instructors.		2
Goal 65. Accelerate learning by emphasizing the positive lessons from successful incidents, not just the negatives from failures.	*2*	
IS 1 – Identify positive case studies for use in training.		2
IS 2 – Reward and publicize people involved in making exemplary decisions.		2
Goal 66. Training needs to be made more realistic.	*1*	
IS 1 – Increase use of realistic field training and exercises.		1
IS 2 – Develop more case studies and simulations based on real fires.		1
IS 3 – Increase the use of simulations and interactive exercises.		1
IS 4 – Conduct skills training "in context" of realistic scenarios.		2
IS 5 – Provide realistic shelter training to all wildland firefighters.		1
IS 6 – Make use of live fires and prescribed fires for training.		
IS 7 – Improve quality of instruction.		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 67. Provide an adequate level of training to seasonals.	*1*	
IS 1 – Analyze seasonals training needs (quantity as well as content).		2
IS 2 – Improve content and consistency of refresher training.		1
IS 3 – Lengthen "pre-season" for at least first time seasonals and certain specialties.		2
IS 4 – Provide more off-season training for seasonals.		3
IS 5 – Include in the Red Card system seasonals with ICT 5 or higher level certification.		3
IS 6 – Strengthen Smokejumper and Hot Shot refresher training with respect to safety.		2
IS 7 – Take advantage of down-time for training.		3
IS 8 – Provide incentives for seasonals to return.		2
Goal 68. Develop training priorities to make the most efficient use of the limited training resources.	*2*	
IS 1 – Use overall training needs analysis to set priorities.		2
IS 2 – Target certain individuals.		2
Goal 69. Provide supervisors with training in leadership and supervisory skills.	*1*	
IS 1 – Train supervisors, IMT members, FMOs, and dispatchers in key "human" skills.		1
Goal 70. Teach wildland firefighters the basics on hazards faced in the urban/wildland interface.	*2*	
IS 1 – Train on the interface hazards to expect, and how to deal with them.		2
Goal 71. Maintain skills and safety awareness with on-the-job (and refresher) training. (Also accelerate the build-up of experience.)	*1*	
IS 1 – Develop a formal OJT training program, including teaching supervisors how best to provide OJT.		1
Goal 72. Provide training to crews on the reaction skills needed in dire emergencies that endanger them.	*1*	
Goal 73. Instill in each firefighter the necessity to switch modes and take extraordinary action in extraordinary emergency situations.	*2*	
IS 1 – Train on emergency skills at the individual level.		1
IS 2 – Train on communicating in emergencies.		1
IS 3 – Emphasize "stress-resistant" training.		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 74. Prepare leaders for decision-making under stress.	*1*	
Goal 75. Prepare the entire workforce, not just leadership, for working under conditions of stress.	*2*	
IS 1 – Develop a Decision Skills Training program.		1
IS 2 – Increase emphasis on "naturalistic" and "recognition-primed" decision-making.		2
IS 3 – Search for ways to reduce workload and stresses in the field.		3
IS 4 – Encourage self-development of ways to cope with stress.		2
IS 5 – Develop a catalog of visual indicators or cues of situational change.		2
IS 6 – Talk about stresses and raise awareness.		3
Principle – People must not be pushed beyond their capability.		
Goal 76. Monitor and reduce fatigue levels to safe limits.	*1*	
IS 1 – Limit the duration of field assignment to two weeks.		1
IS 2 – Assure comfortable, quiet sleeping conditions.		1
IS 3 – Improve dissemination of information on the need for adequate hydration and nutrition.		1
IS 4 – Conduct further study of sleep deprivation and other factors affecting fatigue of firefighters.		3
IS 5 – Use transportation or spike camps to reduce fatigue.		2
Goal 77. Crew Supervisors Division Supervisors and Incident Management Teams must get the information they need, but also be shielded from a flood of unnecessary information, and the risk of information overload.	*2*	
IS 1 – Be selective on what is broadcast and what is requested.		2
Principle – Foster physical fitness for the job*		
Goal 78. Develop a widely accepted physical fitness test for wildland firefighters.	*1*	
Goal 79. Physical testing must be conducted honestly and for all.	*1*	
Goal 80. Minimize wildland firefighter fatalities from health or physical conditioning factors.	*1*	
IS 1 – Finish validation and acceptance testing of the Pack Test series or another new physical fitness test, and rigorously enforce the new test.		1
IS 2 – Require contractors and encourage all others at Federal fires to meet the new physical fitness test.		2
IS 3 – Educate the workforce about the new test.		3
IS 4 – Hold testers accountable.		1

* Reducing fatigue is a key aspect of human factors considerations, but could also be grouped under leadership issues.

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Principle – Foster unit cohesion.		
Goal 81. Foster better crew cohesion, especially among Type II crews.	*2*	
IS 1 – Adapt and adopt CRM-type training and attitudes.		1
IS 2 – Develop assessment instrument to periodically refine CRM-type training.		2
IS 3 – Infuse CRM principles throughout training.		2
IS 4 – Employ team building technologies when teams first meet.		2
IS 5 – Consider use of outside vendor for CRM development and training.		3
IS 6 – Develop work climate of trust through changes in the culture.		2
Principle – Practice safety day-to-day.		
Goal 82. Develop a safety culture that encourages people to think in the context of safe practices, standards, and procedures.	*2*	
IS 1 – In addition to all of the above, get firefighters and managers to raise safety consciousness in day-to-day activities.		2
EXTERNAL INFLUENCES		
Principle –Promote prevention and fuel treatment programs.		
Goal 83. Educate the public on the limitations and dangers of wildland firefighting.	*2*	
Goal 84. Educate the public on the specific mitigating factors that may influence wildland fires and reduce damage from them.	*2*	
IS 1 – Promote public education on the limitations of firefighting and practical mitigation efforts through a variety of venues.		2
IS 2 – Broaden the efforts of the Wildland/Urban Interface Group, and link them to others.		3
IS 3 – Use the Internet.		3
IS 4 – Distribute catalog of public education materials.		3
Goal 85. Fire budgets and their allocation need to be set with an eye toward their implication for firefighter safety.	*2*	
IS 1 – Fund the new safety initiatives.		1
IS 2 – Get budgeters to clarify the potential impacts of different budget levels, including the shift to do more prevention and hazard reduction.		2
IS 3 – Inform firefighters and fire managers about the budget decision.		3
IS 4 – Modify the Fire Management Leadership course to reflect impacts of alternative budget strategies.		2
IS 5 – Develop an interagency fire prevention strategy as input to budget.		2

GOALS AND IMPLEMENTATION STRATEGIES	PRIORITY RATING[7]	
Goal 86. Improving forest health and removing accumulated fuels should be pursued to reduce the intensity of fires.	*1*	
IS 1 – Consolidate diverse strategies into a cohesive plan.		2
IS 2 – Consider using multiple funding options.		2
IS 3 – Amend the National Environmental Protection Act to require consideration of firefighter safety.		3

APPENDIX A. CENTER FOR LESSONS LEARNED

Building an Experience Base

One means of achieving an overall gain in expertise is for an organization to compile and disseminate analyses of the way critical situations were handled, and examples of good and poor decisions. This type of activity can be central to organizational learning. Currently many different organizations are attempting to compile their lessons learned in an efficient manner. One of the best examples is the U.S. Army's Center for Army Lessons Learned (CALL). Another is the aviation community's Aviation Safety Reporting System (ASRS). The Economist magazine (October 4, 1997, pp. 79-80) reported that the banking industry is trying to set up a method for capturing lessons learned, modeled on ASRS. These are good precedents for the wildland fire community.

This Appendix expands on the concept of establishing a "Center for Lessons Learned" for the wildland fire community, as recommended in Chapter 3, Goal 4, Implementation Strategy 2. We discuss three aspects of a Center for Lessons Learned: the nature of the information collection process; the nature of the information dissemination; and the formatting of the materials to be collected.

The Nature of the Information Collection Process

There is reluctance among firefighters to report safety incidents. If firefighters are too worried about getting in trouble, they are unlikely to be fully candid about what happened. Fear of retaliation and the difficulty of the reporting process represent the greatest barriers to collecting and to some extent using lessons learned. If the agencies use "lessons learned" to punish others, that would serve as discouragement. If the process of filling out forms and finding the correct address to send in lessons is too cumbersome, cooperation will decrease.

Therefore, a Safety Center for Lessons Learned will have to ensure anonymity of information stored and used, prevent retaliation, and yet facilitate open communication. In the aviation industry, the ASRS provides legal safeguards against penalizing those who report problems. When a pilot reports a transgression of safety rules to the ASRS the pilot is shielded from punitive action. In other settings, the lessons learned reports are sanitized by removing names and details. In the Army, the lessons learned are about neutral topics, such as the use of

equipment or dealing with various situations, and not about individuals. The fire agencies will need to determine the desired focus of their center and the safeguards to use.

There is need to consider how far to go with sanitizing the reports. Because firefighting is done in the context of large organizations, each incident will have many direct witnesses and many more indirect ones. In order to sanitize a report, and not be a recognizable incident, the incident account might have to be cleaned up so much that it would become useless. Also, because fire incidents are known by their names, some of the believability and impact of the stories may be lost. However, names of people can be dropped, and in many cases a description of the circumstances and factors associated with the 'lessons learned' may suffice. In fact, providing too many details may weaken the point to be made. Judgment will be needed on what to keep in any given preserved story.

There are other choices that could be made as to the nature of a reporting center. The Center could be restricted to anecdotes on neutral topics such as equipment and tactics. This may be a necessary restriction but many of the ways in which safety gets compromised involve personal decisions and judgments, so this would be giving away a lot.

Another alternative for the nature of the reporting center is to focus on accountability and punishment. While this may seem harsh, several individuals in the early one-on-one interviews stated that they felt the agencies went too easy on mistakes, and that they should be more critical in their evaluations. In this case, the wildland fire community may find that a Center for Lessons Learned can provide a valuable resource, enabling people to speak up about unsafe practices, and to name names. Lessons learned reports can serve as the beginning of investigations into Crew and Division Supervisors and higher levels of command who violate safety standards. While ensuring the anonymity of the respondent, the agencies can assess whether the charges are accurate, and, if so, how to prevent similar problems in the future. This strategy would be to increase personal consequences, rather than reducing them.

We do not, however, think either of the above two alternatives are the right approach for the Center. The accountability goal can be achieved by the line management of an incident, filing formal complaints or incident reports that name names. The Center should take a more anonymous, non-punitive, non-embarrassing approach. It may indeed include cases that lead to punishment but that should not be its focus – rather, the focus should be on lessons learned, the "wisdom" gained from errors and from case studies of successes.

Some organizations provide a safeguard by limiting access to the lessons learned file, so that only researchers and others with a legitimate need can go through the cases and find patterns that might be important. Only selected, sanitized incident descriptions or situations are disseminated. This is a possible fallback position, but it reduces motivation to build a comprehensive lessons learned file. The correspondents would be going to the effort of filing the account with no assurance that others at their level would be able to learn from it.

We recommend that the agencies use a Center for Lessons Learned to collect and disseminate sanitized incident accounts to increase organizational learning. The Center should not deal with serious cases of safety violations, and the agencies should set up a separate mechanism for reporting these to avoid compromising the effectiveness of the Center.

The Center should encourage firefighters to send in incident accounts in order to improve the safety and professionalism of firefighting. Cash incentives do not seem appropriate in this environment, and might even be counter-productive. The Center should have writer/editors to assist fire service personnel in preparing incident descriptions, or editing what they send in.

The Nature of the Information Dissemination

A wildland firefighting Center for Lessons Learned would be challenged to find a way to make use of the incident accounts and not become a black hole. Collection organizations often find it convenient to settle into a bureaucratic mode of collecting and cataloging, taking a very passive attitude towards the work, and imposing lengthy delays on the time for getting the incident accounts into circulation.

A successful Center should compile statistics about the types of incidents, types of difficult judgments, and so forth, and make these the basis of further action. While it would not be a scientific sample, the collected incident accounts would provide a reasonably good cross-section of the types of safety concerns that exist, and the ways these change from one year to the next.

In addition, the Center should select the best incident accounts, and format them to be used as Tactical Decision Games in leadership courses and training on decision making (See Appendix C). In this way, the agencies would arrange a feedback mechanism for using the most difficult cases as training opportunities.

But most of all, the Center should emulate the Army and aviation examples, and quickly disseminate good lessons and stories in newsletter form. See, for example, the aviation newsletter on the following page.

The wildland Center for Lessons Learned might also convert incident accounts into tape recordings and make them available to crews during lengthy periods of transportation. Instead of enduring these periods as unproductive down-time, they could become learning opportunities.

Formatting the Materials Collected

There are many different ways to format incident accounts. The ASRS reports are fairly well structured, as befits the highly structured nature of commercial aviation. However, the Boeing Corporation has been developing an alternative format. They are interested in getting feedback from line pilots about problems they encounter with Boeing aircraft, and about difficult incidents. Boeing realized the futility of searching for a root cause for accidents and near-accidents, and has moved to the use of "influence diagrams." Instead of searching for the root cause, Boeing tries to identify the set of potential causes or factors influencing the incident. The participants are asked to list anything that, if changed, could have prevented the accident (or near-accident). This approach shows the set of causes that contributed. They can be arranged into an influence diagram (a sequence of what thing influenced another, which ultimately caused the problem.) This approach cuts down on "finger-pointing," because there are usually many ways in which the various participants in the incident could have acted more safely. It converts a potential witch-hunt into a legitimate search for problem sources.

Yet another format is to borrow from the "Decision Critique" approach mentioned in the sections on decision-making in this report (see Appendix C). The person reporting the incident could begin with a brief narrative of the incident (perhaps including a map) and then answer the following questions: Which were the difficult judgments and decisions? Why was each of them difficult? What cues or patterns got missed? What was the original size-up, and was it accurate?

It is very beneficial to gather inputs from several witnesses to an incident, to see if there is consensus, get different viewpoints and different insights.

CALLBACK
From NASA's Aviation Safety Reporting System
ASRS
Number 223 January 1998

Too-Close Encounters

Even with adequate supplementary lighting, flight crews need to allow an extra margin for error to accommodate the reduction in visual perception that occurs at night. An air carrier First Officer reports that on a well-lit ramp, the crew's perception of the available parking space was still faulty:

■ *After landing...we switched to Ramp Control...and asked which taxiway they wanted us to use. Ramp Control advised us to use taxiway Z. As we approached the gate... it looked like we were getting very close to the side of the concrete wall that supports a walkway bridge over the taxiway. As we emerged on the other side of the walkway, I felt a slight bump. It felt like we had taxied over a drain grate. After we pulled into our assigned gate, one of the ramp personnel came to the flight deck and advised us that we had hit the bridge. We looked at the tail of the aircraft and could see what appeared to be some damage. The Captain went to call Flight Control. I walked to the bridge, where I was handed some pieces of the aircraft.*

The crew had NOTAMs indicating that the taxiway route was not safe for that size aircraft, and airport charts indicating maximum wingspan and tail height for clearance under the bridge. The reporter's recognition that "we were getting very close" should have caused the crew to stop and question Ramp Control's instructions.

Altered visual perception at night may be even more troublesome in flight, where a third dimension–altitude–adds to the potential for misinterpretation of the visual cues. An air carrier Captain credits TCAS with accurately "seeing" conflicting traffic when the crew could not.

■ *While descending toward ABC, we were cleared to...intercept the localizer course for Runway 30. Center then issued a VFR traffic advisory to us—a General Aviation airplane was also descending into ABC. The GA airplane was also advised that we were descending. [Each aircraft] reported the other aircraft in sight.*

Just prior to intercepting the localizer at 12,000 feet, we received a traffic alert from our TCAS. We still had a visual on the airplane, but it was difficult to ascertain his altitude or heading due to the darkness. Very quickly after that, the TCAS issued a resolution advisory to "descend, descend now!" We complied, increased our rate of descent, and turned right to avoid the target. I estimate that our aircraft passed within a half mile of each other and were separated by 100-200 feet vertically.

At night, it is easy to misjudge the altitude and distance of closing aircraft. TCAS II is an excellent resource that can aid in determining aircraft position and rate of closure. However, pilots should also remember to ask ATC for specific assistance with aircraft separation. Brief queries directed to ATC—"Can you keep us informed on spacing?" or "What's the altitude of our traffic?"—can help illuminate the traffic picture. ◢

ASRS Incident Reports Available at Web Site

On January 15, 1998, ASRS will begin offering a selection of incident reports at its Web site:

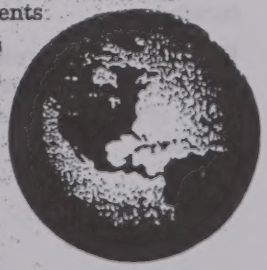
http://olias.arc.nasa.gov/asrs.

The reports will be grouped according to frequently requested database search topics. This new offering is intended to bring ASRS data to a wider user community, and to provide recent report samples relevant to users' training and operational activities.

Each report group (report "set") will consist of 50 recent ASRS database reports that have been pre-screened to assure their relevance to the pre-selected topic description. They will be formatted for downloading into RTF (Rich Text Format), which can be read by most word processing applications and by many other programs, including spreadsheets.

The reports sets will be updated quarterly. New topics will be added–and outdated topics removed–in response to input from the ASRS user community, and analysis of Web site usage. Following is a preliminary listing of the report topics that will be available in January 1998:

- Multi-Engine Turbojet Upset Incidents
- Wake Turbulence Incidents
- Controlled Flight Towards Terrain Incidents
- Checklist Incidents
- CRM-Related Incidents
- Commuter Flight Crew Fatigue Incidents
- Fuel Mismanagement Incidents
- General Aviation and Commuter Icing Incidents
- Pilot/Controller Communications Incidents
- Land and "Hold Short" Incidents
- Non-Tower Airport Incidents
- Inflight Weather Encounters
- Runway Incursions
- TCAS II Incidents
- Cabin Crew Incidents
- Mechanics Incidents
- Rotorcraft Incidents ◢



ASRS Recently Issued Alerts On... | A Monthly Safety Bulletin | November 1997 Report Intake

Weathering Heights

Two General Aviation pilots report on their challenging encounters with simultaneous IMC and mechanical difficulties. The first reporter was well-prepared with good back-up equipment.

■ *Shortly after departing on an IFR clearance, I experienced...a bad alternator. I shut down everything I could...then I lost the other alternator. Before I could request vectors from Approach, I lost total electrical. I had a hand-held transceiver to listen, but I could not transmit. I also had a hand-held GPS, and used that to navigate to my destination. It was VFR there, so I continued my flight, as I was cleared.*

Once in a while, after letting the [aircraft] battery charge, I could transmit for about 7-10 seconds. So I let Center know what was going on. They let me descend to 3,000 feet, but that did not get me out of the clouds. I let the battery charge enough to contact XYZ Tower, and they let me down still further. Still in IMC. As I got about 20 miles from my destination, I broke out into VMC. I continued and landed.

The mechanics said one alternator had a broken belt, and the other had a terminal burned out. Two totally unrelated problems.

In this case, limited communication and navigation equipment provided the reporter with enough information to relay his problems to ATC and land safely. In instances where a failure occurs shortly after take-off, an immediate return-to-land is an option that should be considered.

The next reporter was less prepared—in knowledge of FARs—to make a decision about accepting an IFR clearance when the weather took a turn for the worse.

■ *While flying VFR with flight following, I experienced a vacuum pump failure. Conditions ahead appeared to require an IFR clearance, so I advised the Controller that I had experienced a vacuum pump failure and therefore the heading and attitude indicators were inoperative. I also told him that conditions ahead appeared to require an IFR clearance. He asked if I preferred to land or file IFR. I indicated that, since I was having no problems, I would prefer to file IFR. He issued an IFR clearance and provided no-gyro vectors to the airport. I landed with no problems.*

Since then I have learned that he probably should not have issued the clearance because you should not enter IFR conditions with an inoperative vacuum pump. He should have advised me of that.

It was the pilot's responsibility—not the Controller's—to determine the legality of IFR flight. The situation could have been avoided if the reporter had executed a 180° turn at the first sign of deteriorating weather.

Between a Rock and a Hard Place

That's where an air carrier Captain found himself, with the rock being conflicting traffic, and the hard place being thunderstorm cells.

■ *Our flight plan showed SIGMETs for embedded thunderstorms in the area and PIREPs of moderate mixed ice. On departure...two thunderstorm cells popped up on the radar screen. Our company policy is to avoid this kind of cell by 5 miles or more. The Departure Controller was talking non-stop to other airplanes, preventing us from requesting a weather deviation or declaring an emergency.*

I had the choice of entering the cell, or turning to avoid the cell (by maybe one mile, by now) and hoping that TCAS and/or the Controller would warn us of traffic. I chose the latter. I didn't see any TCAS traffic displayed, and turned right. The First Officer was finally able to advise ATC. We were told to level at 12,000 feet due to traffic, and were reprimanded for not getting permission before turning.

We followed FAR guidance: ask permission; declare an emergency if necessary; if unable to make contact, for the safety of the flight, deviate, then notify ATC as soon as possible.

Part of attempting to declare an emergency should include squawking 7700. This immediately notifies ATC of a problem, at which time the Controller will be alerted that the flight crew needs to make a request.

Another Captain in a similar "hard place" deviated without any attempt at ATC contact. The First Officer reports:

■ *Over [oceanic] routes, the Captain deviated [over 20 miles] off-course when thunderstorm build-ups were along our route, **without** contacting any controlling agency. The routes are in an area where we are in radio contact for position reporting (usually HF), and in the area where **we all think** we are not in radar coverage. WRONG! I knew, and conveyed to the Captain, that ATC could see us even though we were reporting positions on HF. I don't have a problem with circumventing weather and known turbulent conditions, but some attempt must be made to communicate with ATC or other aircraft to advise them of our conditions and intentions.*

Course deviations beyond the boundaries of an airway may cause ATC to consider an aircraft lost, or worse, a national security threat.

An organization designed to collect and disseminate lessons learned, regardless of the format it uses, can provide a highly valuable component of a safety program for the Federal wildland fire community. Each safety incident triggers a learning process, and the very fact that the agencies have set up such an organization sends a message that everyone is expected to contribute to a culture of safety.

APPENDIX B. ON-THE-JOB TRAINING

The wildland firefighting job requires working in proximity to danger, and is inherently risky. However, though they work close to danger, few firefighters have been in critical situations such as having to deploy fire shelters, etc. Therefore, they do not accumulate certain types of important experience first hand. Direct experience takes a long time to accumulate, and carries risks with it. Consequently, the accumulation of experience is likely to be slow because the opportunities to explore the edge of the risk envelope will (hopefully) be limited.

This is why it is important to speed up the learning curve for wildland firefighters. Crew Supervisors must recognize and understand acceptable risk. If Crew Supervisors have too little tolerance for risk, and they withdraw at the slightest sign of danger, they cannot perform their job. In addition, they cannot learn the edges of the risk envelope, because they are not experiencing those edges. However, if Crew Supervisors accept too many risks, they act irresponsibly, putting crews in harm's way unnecessarily.

The agencies try to use rules to help firefighters react effectively to risks. Different lists of rules and danger signs exist now, including LCES, 10 Standard Fire Orders, 18 Watch Outs, Downhill guidelines, etc. However, as has been discussed elsewhere in this report, prescriptive rules do not adequately ensure safety. Each rule is itself a compilation of experience and requires experience in order to know-how to interpret it.

This report presents a number of recommendations for developing training that can speed up the accumulation of experience and hence directly impact the safety of wildland firefighters. Here we discuss a key platform for delivering training to speed up the accumulation of experience, a program for on-the-job training (OJT). This Appendix elaborates on the discussion of On-the-Job Training in Chapter 5, Goal 71, Implementation Strategy 1.

On-the-Job Training – Basic Skills

In most workplaces, on-the-job training (OJT) is the primary way that people learn what they need to know to do their job. Classroom training often lacks realism and does not completely transfer once the trainees are in the workplace. Also, many classroom training practices contradict much of what we know about adult learning: that adults need to see the immediate relevance of what they are learning, they need to be actively engaged in exploring,

they need to build their own mental models, and they learn best when they are initiating the motivation. Often, classroom training disengages the learner from the job context, makes the learner passive (e.g., by forcing groups to sit quietly and listen to lectures), tries to impose the instructor's mental model on the entire class, and substitutes the instructor's motivational skills for the trainees' own motivation. Yet, most of the training budget in business, the military and the agencies sponsoring this study is spent on producing or buying training systems such as professionally-conducted classroom programs, reading materials such as textbooks and pamphlets, or software for computer-assisted instruction.

Organizations sometimes produce procedural manuals or checklists of how to train new trainers. These manuals may include general training guidelines such as: demonstrate, ask questions, allow trainee to practice, and give feedback. This implies the use of OJT. However, very few organizations help the OJT providers develop the skills to deliver effective training. These skills include:

- how and when to use various instructional techniques
- how to diagnose the reason why a trainee "just isn't getting it"
- how to set reasonable learning goals
- how to re-adjust learning goals so that the trainee is neither bored nor intimidated
- how to notice and change a poor learning climate
- how and when to pass on one's expertise
- how to be a manager of someone else's learning
- how to identify the "teachable moment" (with examples appropriate to what happens on a given day).

Most organizations do not train their trainers on specific and practical OJT skills. The net result is that the driver to success — the OJT provider — has been virtually forgotten by the thousands of military and civilian organizations that depend on OJT to train their workforces. In local fire departments, the Captain is responsible for all functions, including training of his or her unit. However, Captains are given little preparation for being trainers. If preparation is offered, it is frequently about classroom types of instruction: how to present the training modules that are continually being developed by the training department. Rarely are the Captains shown how to provide OJT. As a result, the greatest training resource in the station, the expertise of the senior officers, goes untapped.

An Expertise-Centered Approach to OJT

Generally, expertise refers to the skills and the competence that an individual gains from a wide variety of sources. These include classes, workshops, reading, and experience. However, people have to learn a significant portion of their information and skills on-the-job. Firefighters develop many of their perceptual skills by experiencing things first hand. Take for example the ability to determine when the fuel moisture content has dropped to a potentially dangerous level. This is knowledge that can be taught in the classroom through video and other means up to a point, but there is also a subtle knowledge that must be learned experientially.

Another aspect of expertise is the ability to recognize uncertainty. Uncertainty encompasses a variety of factors including ambiguous, missing, and/or contradictory information. It often takes expertise to be able to recognize uncertainty and to be able to deal with it. This is a skill that is not easy to teach in a classroom since it often involves the ability to recognize the absence of something, rather than its presence. The important point to these examples is that expertise is not always easy to communicate via traditional training/learning methods and often must be accumulated first hand, i.e., on-the-job.

An expertise-centered OJT approach requires that expertise exists among a wide body of OJT trainers. Of course expertise does exist in the firefighting community, and in great quantity. We must be realistic and recognize that all similarly certified individuals do not have equal expertise. However, expertise is still present to one degree or another and we have to take advantage of, and leverage whatever amount is present. The agencies need to help people do a better job of passing on whatever expertise they do possess.

OJT can be delivered anywhere along a continuum from unstructured to completely structured. Neither extreme is desirable. Unstructured OJT is typical. People usually are expected to pick up the nuances of their jobs by osmosis, by accident, or just by hanging around more skilled firefighters who have not been taught how to be good mentors. This approach seems to work eventually, and is how many new firefighters learn the difficult parts of their jobs. However, this form of OJT takes a long time, and is inefficient. In addition, unstructured OJT has a big drawback. Improving a trainee's perceptual skills, such as size-up or situational awareness, requires them to notice subtle cues, recognize what you don't know and what information is missing. Unstructured OJT is very unreliable for getting these skills across.

On the other end of the continuum lies highly structured OJT. Here, trainers see the field setting as an extension of the classroom. Trainers carefully prepare learning objectives, design evaluation procedures, and drill OJT providers on ways to get these objectives across. These highly structured methods are helpful for some types of skills. For example, when a new piece of equipment is issued, the firefighters will benefit from training guided by objectives, exercises and evaluation criteria to ensure that they gain competence in using it.

A completely structured OJT program has some serious drawbacks, too. It is expensive to design and implement, and can run counter to what we know about adult learning. A structured OJT program is still trying to impose the learning process and still trying to teach a mental model rather than guiding the trainees to develop their own mental models. Structured OJT programs decompose complex tasks into the small elements that can more easily be taught, but create the difficulty of re-composing these elements to fit into the real world. Structured OJT programs do best with highly procedural tasks. However, to build a culture of safety, one of the biggest challenges the agencies face is to build expertise at sizing up situations, a skill that is difficult to drill.

A useful approach to developing an OJT program thus is to steer clear of the extremes, and to use a semi-structured approach. The agencies should not leave everything to chance (as in an unstructured approach) or decompose everything into micro-tasks and objectives (as in a highly structured approach). If the agencies want to use OJT to improve safety, the emphasis has to be on the development of expertise, rather than on procedures.

One key area on which to focus OJT is achieving situational awareness. Situational awareness includes the ability to detect when situations have shifted, to anticipate how situations are likely to develop, to make subtle perceptual discriminations, to spot problems very early, and to identify leverage points for overcoming problems. It is crucial to making decisions under time pressure and various degrees of uncertainty.

The aim of OJT is not just to teach crews how to carry out tasks and operate equipment, or teach safe as opposed to unsafe procedures. Rather the training also should enable firefighters to detect when safety margins are being violated. For example, we know that driving trucks over mountain roads at night is risky. We also know that fatigued drivers, who have worked all day, compound the risk. We can issue directives, like "people who are too fatigued should not drive." However, directives are no substitute for the skills needed to determine that a crew member falls into this category. It takes experience to gauge that a person is too fatigued to be assigned the

task. We can try to substitute artificial metrics (e.g., the amount of hours since the previous rest break), but these are not reliable. The aim of an OJT program should be to develop the perceptual skills to detect when margins of safety are being exceeded.

Therefore, as mentioned before, the OJT approach we recommend is centered around building expertise. We want to develop expertise that provides firefighters with judgment, perceptual skills, and the ability to anticipate and improvise. Firefighters should be able to judge what is typical versus what is an anomaly, perceive subtle discriminations, anticipate how a situation will or can develop, employ tricks of the trade, and improvise on the spot. We see these skills in experienced Incident Commanders, Operations Section Chiefs, Division/Group Supervisors, and Hotshot Crew Superintendents. Some experienced Single Resource Bosses have them, but others are still learning them. Some of the highly trained Type I Squad Bosses and crew members may have these skills. In general, few Type II crew members have these skills, and they may not need to develop them to a high level.

The better fire crews and the levels above them can get at understanding the big picture, the safer fire operations will be. As Crew Supervisors and their crews move up the learning curve and develop expertise more quickly, we expect that they will be making better judgments, and making them more rapidly. By understanding causal dynamics in a wildland firefighting situation, fire personnel will see implications and make preparations in advance, rather than reacting behind the power curve. "Causal dynamics" can include the ability to recognize the limitations of your crew and to recognize that the "edge" for your safety envelop will be different than that of other crews.

Components of OJT

For all of the reasons above, we suggest that the agencies use an expertise-centered approach to teach people how to use OJT. The approach consists of three primary components: climate-setting, assessment/diagnosis, and actual instruction.

Climate-setting for the learning process is important because adults learn best when they are learning what they want to know and helping to direct the process, as partners. Adults learn best when their motivation drives the search and they feel a sense of ownership. Adults learn best when they are not afraid of being criticized or belittled by sarcastic instructors, but are able to admit confusion and ignorance, and to trust the OJT provider with this knowledge. The learner

must trust the OJT provider to admit his or her own ignorance rather than feeling threatened by a tough question.

Some experienced Crew Supervisors are setting the wrong *climate,* one of fear and intimidation, perhaps to ensure that their orders will be obeyed quickly and without question. Some experienced firefighters are too ready to use mockery or ridicule of those just learning their trade. A good OJT program should not undercut the authority of a supervisor. OJT providers must understand how to set a good learning climate without compromising their authority.

Collaborating about goals represents a central aspect of setting a good climate. Adult learners often brush off or resist learning that is pushed or foisted. The goals need to reflect the OJT provider's assessments and the trainee's needs, along with the organization's requirements and timelines. Goal collaboration is a vital part of climate-setting. Thus OJT providers need to be taught how to set the right climate, and how not to destroy it.

Assessment/diagnosis of the trainee is another important component of OJT because a skilled OJT provider is in the best position to gauge a trainee's needs and progress. The wildland fire community depends heavily on the judgment of supervisors when it comes time for giving expanded responsibilities and assignments. The supervisor often decides (assesses) who is ready to handle these new responsibilities and who can think clearly enough to make quick decisions. Assessment is central to providing accurate feedback and helping modify the trainee's goals. Unfortunately, there usually is little preparation to help a supervisor gauge the competence of subordinates. Supervisors too often tend to base their judgments on considerations other than skill level.

Diagnosis also represents a critical instructional function. It is one thing to see someone making a mistake in operating a piece of equipment, such as a chain saw, but another to figure out why the person is making that mistake. If the OJT provider can diagnose the reason for the problem, then it is much easier to train the person to do it the right way.

Instruction is of course the all-important field delivery aspect of OJT. OJT providers need to develop a broad repertoire of *instructional methods*, particularly methods for sharing their own *experience and expertise.* Most training manuals concentrate on instruction suitable to lecture halls and classrooms, but the instructional repertoire needed for OJT is very different. OJT requires techniques for cognitive modeling, ways to assist trainees to build their own mental

models and for finding and using opportunities for active application. OJT includes techniques for providing specific, context-bound observations because generic principles and abstract platitudes are usually too vague to be helpful. OJT includes "thinking out loud" to share the interpretive logic a person uses to make a decision.

While firefighters may argue that the certain generic principles such as "don't build downhill lines" are valuable, the problem is that this does not help them recognize when they are in an "edge of the envelope" situation, or what could change that could turn the current situation into a dangerous one. Therefore, an effective OJT program includes a sense of when and how to give feedback. Since immediate feedback can get in the way of learning, it is best for trainees to have a chance to obtain their own feedback about the adequacy of their performance, just as they will have to in the field.

Specific Instructional Skills

Research psychologists have identified 57 different instructional strategies or skills that can be used in an OJT environment. The skills are listed in Table B-1, which came from a case study of the use of OJT in a retail company. The table shows the percent of OJT providers who were found to use each of the 57 skills identified; the report from which it came elaborates further.[1]

Perhaps the most important of these skills are the ways for a supervisor or experienced crew member to pass on expertise. This involves teaching more than what is available in a training manual, teaching more than basic procedures, and includes the skills of detecting anomalies, recognizing opportunities, anticipating and preventing problems, and compensating for errors. In many cases, this expertise is centered around perceptual skills, which are notoriously difficult to describe. What does an experienced firefighter look for? What questions does he or she ask? The paradox is that the more experienced the OJT providers are, the less able they are to describe what they know and what they can see. Yet, even for these types of skills, methods exist for helping new crew members come up to speed.

[1] "OJT: A Cognitive Model and Prototype Training Program for OJT Providers, U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA, by Klein Associates, Inc., under Contract MDA903-93-C-0092, August 9, 1995.

PERCENT OF OJT-PROVIDERS WHO USED PARTICULAR STRATEGIES

100% (16/16) respectively	94-81% (15/16-13/16) respectively	75-63% (10/16) respectively	56-44% (9/16-7/16) respectively	38-25% (6/16-4/16 respectively	19-6% (3/16-1/16 respectively)
• Tell (describe procedural steps) • Observe • Use training tapes (provided by company) • Encourage trainee to summarize (self-review)	• Model (watch me) • Direct trainee's attention • Elicit questions • Give performance feedback re: incorrectness • Role play • Pose open-ended questions • Give reasons why • Be nearby, but not "on top of" • Adapt amount/level of support to learner's current state • Shadow (follow) trainer	• Give performance feedback re: praise • Use examples; analogues • Evaluate trainees questions (quality, frequency, etc.) • Offer independent practice opportunities • Explain why trainee needs to do it a certain way • Generate job aid • Give performance feedback re: offer alternatives • Allow trainee to make mistake and see consequences • Put trainee at ease	• Give performance feedback re: correctness of specific behavior within a performance stream • Set performance goals • Monitor body language for understanding • Be patient • Guide trainee through task verbally while they do it • Give what can go wrong • Give test(s) • Encourage trainee exploration of interaction with work env't (i.e. trainee "experiments" with printer) • Convey context of job–big picture. • Assign to SME[1] for specific periods • Offer incentives for mastery • Expose trainee to peer modeling	• Break material into smaller pieces • Ask how it's going (seek trainee FB about training process) • Use humor • Praise in public • Give hints/prompting • Elicit reasons • Keep other employees informed of trainee's progress; where s/he needs their help • Display confidence in trainee's ability to perform target job • Scaffolding [hands-on help, gradually tapered off] • Posing questions: closed • Elicit trainee suggestions (about how best to perform task)	• Performance feedback re: criticism of either specific or general behaviors • Invite trainee to voice worry/stress/fear • Criticize in private • Pause frequently during verbal explanations • Maintain records showing progress • Elicit trainee predictions re: cause-effect relations • Give "panic-button"–what to DO when "X" goes wrong • Think out loud while demonstrating (not just naming what you're doing; but describing your thinking) • Summarize • Link concepts and skills to trainee's ability to perform target job • Elicit trainee reflection on various aspects of learning (e.g., their performance compared to others

[1] Subject Matter Expert

We recommend that the agencies establish an OJT train-the-trainers program, and then expect supervisors to carry it out. Such a program would augment classroom teaching and simulation with an active focus on using field opportunities to build the skills of personnel at all levels of authority. If safety can be improved through gaining expertise, then an effective OJT program can be a vital means of ensuring that expertise is expanded where it counts: in the field.

An Example of Expertise-Centered OJT

As noted in Chapter 5, we are confident in suggesting an OJT program with the above skills and components because one has already been initiated within a firefighting organization, and such programs have also been proven in the military. The Los Angeles County Fire Department is in the process of institutionalizing an OJT program for its captains. Several years ago, LACFD determined that there was a disconnect in its organizational guidelines. The captain at each fire station was given the responsibility of ensuring training, but was not given the training or guidance to achieve this objective. As a result, training was restricted to pre-packaged programs developed by a central training department and promulgated throughout the department, mainly by battalion training officers.

To remedy this problem, the LA County Fire Department commissioned a trial program to teach battalion training officers about OJT, and then extended it to all captains. Rather than rely on a one-shot workshop (the easiest way to generate quick enthusiasm, but usually the worst way to ensure continuity), a three-phase package was used. The department first gave the battalion training officers a four-hour workshop on the basics of OJT, including a homework assignment to identify OJT needs and opportunities in their districts. These workshops were conducted for groups of 8-12 trainers. The second set of workshops, held a month later, reviewed the homework, and focused on methods for handling needs and opportunities. The third set of workshops, held a month after the second, reviewed progress in using the methods, was a refresher and brush-up session, and compared lessons learned.

The reaction to this program was highly positive. The recommendation of the Department leadership was that all captains be given this program, and that in the future *new captains be required to gain proficiency in OJT skills prior to being promoted.* The rationale was that without adequate OJT skills, a firefighter could not be an effective captain. Another recommendation was to provide the OJT training to battalion chiefs.

Some unexpected positive consequences also arose as this program developed. In one session, a captain asked if the OJT program could help with motivational problems. The answer was that it could not; OJT was about training, not about poor attitudes. However, in a subsequent workshop session, the captain informed the group that this answer was wrong. He described an incident where he had been frustrated by a firefighter with a very poor attitude. After learning about OJT, the captain realized that he wasn't getting anywhere chewing this firefighter out after every mistake, and complaining loudly about repeated mistakes. Instead, he used the mistakes as an opportunity to talk about what the firefighter was having trouble understanding, and to ask the firefighter how to practice or prepare better. By shifting the climate from one of confrontation to one of learning, the antagonism seemed to dissipate. The "motivational" problem of the firefighter had turned out to be caused by the poor climate that the captain had been creating in providing feedback.

Currently, the Los Angeles County Fire Department has taken the OJT training over from the developers and is putting on its own workshops. The Department has modified the content to better fit its needs, and plans are being made to ensure that in the future, all captains become skilled in providing OJT.

The OJT skills used in L.A. County were first developed by Klein & Associates for the U.S. Army, and more recently are being taught to the U.S. Marines.

Strategy to Establish OJT

To establish an OJT program for the Federal wildland fire community would take several steps:

- Establishing target groups for the program
- Developing the instructional framework and materials
- Designing assessment procedures
- Securing organizational support

Targeting – The groups to target for OJT were discussed in the text under Goal 71. The strategy outlined below focuses on the fireline-rated positions recommended as highest priority. However, much of the OJT of firefighters will occur away from the fireline environment, often during "project work" assignments or routine job duties. Consequently, the agencies should also

target OJT providers by administrative function (team leader, suppression specialist, Assistant FMO, etc.).

Instructional Framework – There are several alternatives for teaching OJT methods. A starting point can be an initial, four-hour course describing the principles of effective OJT, making use of videotaped lectures to cut down on instructor costs and travel expenses. It would be necessary to augment the videotapes with practice applications so that the Crew Supervisors and others have a chance to experience how it feels to give and receive effective and ineffective OJT. The initial sessions would be followed by group sessions to discuss progress, add additional strategies to the instructional repertoires, and trade lessons learned. This is followed by a third workshop, another group session, similar to the second, and answering questions before sending the new OJT disciples out to do training.

The instructional framework for OJT requires direct interaction and practice. The courses are most effective when taught to groups of 8-12 people at a time. An initial pilot program for 6-12 months could be evaluated and then followed by a phase of institutionalizing the program in the field.

To implement the above approach, an OJT training cadre could be established by selecting 3-4 Division Supervisors in each region, providing them with the OJT training, and relying on them to train Crew Supervisors. We have found it possible to present two 4-hour workshops a day to about 10 people in each workshop. In a week, 10 workshops could be presented, covering 100 Crew Supervisors. The agencies could train 100 Crew Supervisors each week, or 400 per month. Once the initial workshops were completed and a cadre developed, the agencies would run the follow-up workshops, followed by a final workshop in the three-workshop series. Under this scenario, the agencies could train 400 Crew Supervisors in a three-month period, using a cadre of 3-4 instructors per region.

Some or all of this initial training could be done by a specialist contractor if the expertise does not exist in-house. Once the program was established, the agencies could efficiently and economically maintain the program and provide training to new Division/Group Supervisors and Crew Supervisors in the field, using the principles of OJT. In that way the OJT program becomes self-sustaining, and the agencies do not have to endlessly repeat the initial investment.

A second alternative training approach is to present OJT training as part of the Crew Supervisors training curriculum. The agencies might find this alternative more efficient but it would require revision of the Crew Supervisors training curriculum.

Our experience is that the agencies would find the first alternative simpler – setting up a program for Division/Group Supervisors. Because of their experience, Division/Group Supervisors would tend to be more sophisticated about training, so the agencies will find the OJT training easier to present. The training of Division Supervisors might even be achievable in two sessions rather than three. The agencies could employ the same videotaped lectures for both Division and Crew Supervisors, but with different training scenarios. The Division Supervisors scenarios/interventions would focus on helping Crew Supervisors. The training for Crew Supervisors would require scenarios focusing on the safety issues of Squad Leaders and firefighters.

The OJT program for crew members and other firefighters (the third tier to train after Division and Crew Supervisors) would be the simplest of all, because they only need a brief lecture, that could be videotaped, on how to learn in a wildland firefighting OJT environment: how to ask questions, when to ask questions, when NOT to ask questions, and so forth. The agencies could supplement the brief lecture with scripted training scenarios.

Designing Assessment Procedures –Assessment procedures are a critical step in an OJT program. The agencies must prepare to assess how a person such as an individual Crew Supervisor is actually conducting OJT. The agencies will have to design assessment procedures that enable Division Supervisors to determine whether a Crew Supervisor is making effective use of OJT techniques, is skilled at transmitting his/her own expertise to others, is helping the senior crew members to explain things to the new members, and is establishing a climate that fosters learning rather than a climate of intimidation that discourages learning. The Operations Section Chief will need to assess the ability of Division Supervisors to achieve the same outcomes among the Crew Supervisors. Without a systematic effort to conduct assessments, the OJT program will gradually diminish and disappear, and the initial investment will be lost.

Securing Organizational Support – Too often, programs are initiated with high levels of enthusiasm and expectation, as if good ideas by themselves will prevail. However, the reality of organizational dynamics is that organizations and the people in them require incentives and attention to maintain momentum. It will take the agencies 5-10 years to fully institutionalize a wide-scale program like an OJT training framework. "Fully institutionalized" means that a new

generation of Crew Supervisors will be inducted into an organization that relies on OJT and expects each Crew Supervisor to competently provide OJT to the people in his or her care.

The agencies must certify Squad Leaders, Single Resource Bosses, and Division Supervisors as being competent to provide OJT, and make promotion contingent on demonstration of such competence. This represents a critical organizational support element for a successful OJT program. This may sound onerous, but the alternative (accepting people in positions of responsibility who are unable to facilitate learning about issues related to safety) seems far less acceptable. The agencies expect that Crew and Division Supervisors are able to provide effective leadership that will keep people safe. The ability to effectively train and coach people represents a critical element of that capacity to lead. Along with the agencies' expectations comes the responsibility to ensure that fireline supervisors have the skills necessary to carry out their responsibilities.

However, it would be unreasonable to impose a requirement for OJT certification before providing ample opportunities to receive the training and practice OJT skills. Therefore, the agencies should establish an OJT program on an informal basis first, followed several years later by certification requirements. The agencies should provide their personnel with adequate warning and announcements about the OJT program so that no one is surprised or disadvantaged.

Conclusion

OJT is cheaper and more effective than classroom training. Once supervisors are trained in how to improve their use of OJT, it is taught "for free," as a routine thing done in the field. Once established, the OJT program also can serve as a platform for various types of field training in the future. It can be a "force multiplier" for the Federal wildland fire community.

The concept of an institutionalized OJT program seems like a major step, and it is. However, the Federal wildland fire community is unlikely to make large gains in safety and in building expertise without taking major steps. The logistics and impact of an OJT program are probably more economical than the investments required by multimedia training. Multimedia training systems are very expensive to develop and are inherently limited in the types of issues that can be addressed. They also raise questions about generalization to the field. In contrast, OJT is inherently flexible, is intended for the field (so issues of generalization do not apply) and is consistent with principles of active learning, as opposed to the typically passive use of media.

In addition, an OJT program offers the potential for financial savings by reducing the need to provide certain types of training in classroom situations (with their attendant costs). An effective OJT program also will yield a variety of secondary benefits, not the least of which is sending a message that the agencies expect their personnel to achieve high levels of competence, and indirectly, that something new has been introduced to the culture to make it safer.

APPENDIX C. DECISION SKILLS TRAINING

A number of concepts were mentioned in the text as the elements of Decision Skills Training, a recommended strategy under Goal 74 (preparing leaders for decision-making under stress.) This Appendix describes the concepts more fully. As noted in the body of this report, the ability to make decisions under stress represents what may be the single most important skill needed to improve firefighter safety. By preparing their people to make decisions, the agencies will make one of the most important human factor changes possible in their organizational culture. Firefighters keep themselves out of harm's way by making good decisions and by responding appropriately when faced with unexpected fire behavior, the risk of being overrun by a fire or other challenges to their safety.

The approach outlined here presents a strategy that enables the agencies to improve their people's decision-making performance in three ways: First, by providing a framework in which the agencies can identify key decision requirements faced by firefighters and use that knowledge to design effective training simulations and tactical decision exercises. Second, by helping individual fire personnel identify the challenging decisions they face in performing their duties. When firefighters employ the decision requirements concept as a training activity they will realize that being able to identify decision requirements is a skill they need. And finally, the concept presented here provides individual firefighters with the ability to reflect on their own abilities to make decisions and, if needed, seek out feedback, training and opportunities to gain expertise.

Specific Training Requirements

1. Decision Requirements Exercise

The first concept in Decision Skills Training is to identify decision requirements, which are:

- The difficult and critical judgments and decisions faced by firefighters (at various levels)
- The reasons why those critical judgments and decisions are difficult
- The types of cues and patterns used by experienced supervisors

The term "decision requirements" sometimes also includes the identification of opportunities available to gain such expertise.

The agencies need to establish decision requirements in the course of developing a decision skills training program, but the process of doing this (i.e., establishing decision requirements) is an exercise in itself to conduct as part of decision training.

Typically, few supervisors realize how many "tough calls" they must make. A list of the types of decisions that need to be made provides a blueprint for the training on types of decision skills that a seasoned, veteran wildland firefighter must have. For example, if a crew is to be transported by helicopter and then hike to the fireline, a supervisor must judge the amount of time the hike will take (e.g., to make sure they arrive in time to be effective, and before it gets dark). Supervisors rarely receive training to make these estimates, or at best, are provided with "rules of thumb" (e.g., it takes about an hour to go 2.5 km). However, the supervisor's estimate preferably should be made in light of the nature of the terrain, weather, personnel fatigue, the amount of gear being carried, etc.

Once it is agreed that a particular type of estimate or decision, such as the foregoing example, needs to be made fairly often, it becomes straightforward to prepare a training regimen for it. Using the example above, the agencies can train supervisors to frequently estimate times of arrival, get feedback about the accuracy of their estimates, and investigate the reasons for inaccuracy when they get it wrong. Without systematic feedback, the supervisor is unlikely to develop the estimating skill. Although the timing estimate may be difficult, once the supervisor can obtain systematic feedback, the agencies can expect a quick increase in accuracy and skill.

Thus in designing training for decision-making, the agencies can achieve skill improvement for a wide variety of types of judgments, but only after they are identified and made the subject of learning. This is the basic premise of training on decision-making.

2. ***"Tactical Decision Games***" refer to low-fidelity, paper-and-pencil simulations of incidents that might occur in the field. The Tactical Decision Game presents the trainee with a dilemma, preferably a situation with high levels of uncertainty, and time pressure. Each participant has 3-5 minutes to consider how he or she would react. These Tactical Decision Games are intended to provide artificial experiences, and to allow practice in rapid decision-making under time pressure and uncertainty.

Tactical Decision Games can be played individually, or in groups. When done in groups, time is needed to assemble and coordinate the players. However, working in groups provides the opportunity for group members to compare their approaches, and realize how many different interpretations and reactions were possible.

Tactical Decision Game materials usually include no more than a map and a page describing the scenario. In one setting, we used a photograph of a situation to show the layout of terrain, and a second photograph that had been touched up to show flames and smoke. The scenario description provides details about how long the fire has been burning, wind direction and velocity, weather forecasts, and the supervisor's assignment. The scenario also includes some unexpected development (e.g., change in wind, failure of equipment, injury to a crew member) requiring a rapid response. The rules of the game require that participants respond rapidly and in the form of giving orders or directions to crew members, mimicking the real world. We don't want the decision makers to describe what they think should be done, but rather to act decisively, issuing crisp instructions. After the decision is made, the Tactical Decision Game requires a discussion of the rationale for the action, including the player's understanding of the dynamics of the situation.

Tactical Decision Games add to the trainees' experience base, prepares them to respond under uncertainty and time pressure, and requires them to formulate their intent. It is not difficult for people to develop their own Tactical Decision Game scenarios to fit the scenarios more closely to the problems they are encountering (i.e., to work on their primary decision requirements). The process of building a Tactical Decision Game is itself a useful learning experience.

3. ***The "Decision Critique"*** is a method for reflecting what went well and not so well during an incident, and how the good and bad decisions were made. The method can also be used to debrief players after they finish Tactical Decision Games. The goal is to use this reflection to increase the degree to which people learn from experience. There is probably little value in this type of reflection for routine operations. However, for difficult operations, particularly those entailing high levels of risk, there can be enormous value in an after-action review.

The decision critique provides a checklist of issues to be considered during such a review (e.g., timeliness of decisions, correctness of decisions). Many organizations conduct after action reviews, covering the actions taken, and other actions that might

have been better. The decision critique complements these efforts by addressing decision processes. These decision processes include patterns that decision makers might have seen earlier, the key cues (seen from the position of hindsight) that the decision maker should have noticed sooner or attended to more carefully, the situation assessments that were mistaken, the uncertainties that were present and how these were handled.

Essentially, the decision critique can use the decision requirements format, listing the key judgments and decisions that were made during the incident, the reasons why they were difficult (particularly with regard to managing uncertainty and seeking information, projecting the situation forward to maintain time horizon, providing shared situation awareness, and ensuring good information management), the subtle cues and patterns that people might miss, and the initial size-up of the situation along with the ways that this shifted during the incident.

In too many settings, people obtain valuable experiences but they are not compiled or reviewed. An exhausted crew might not be eager to hold a seminar, and we do not think that most incidents warrant the use of a decision critique. However, following a near-miss or other incident, firefighters will be motivated to discuss why they got into difficulty, the early signs that crew members had but did not pass along or appreciate, and how they might have handled the situation better. Conducting decision critiques is an important way to improve people's sensitivity to risk.

4. ***The "Pre-Mortem Exercise"*** (as opposed to Post-Mortem analysis) is a way to anticipate risks and identify key vulnerabilities in a plan. After developing a plan, the team spends a few minutes trying to determine where the plan is most likely to fall apart. The objective is to uncover critical flaws and areas of concern that are otherwise ignored. In most settings, once a plan has been developed the critique of it tends to be pretty generous, because no one wants to find a critical flaw (which could generate dissension by criticizing the planner, and could also require the development of a new plan). To overcome this type of inertia, *the Pre-Mortem exercise begins with the assumption that the plan has already failed.* The task of the team is to use their experience to identify the likely reasons for the failure. This exercise consistently generates a wider variety of criticisms, and more serious ones, than a standard critique. The Pre-Mortem exercise could be a valuable means of anticipating risks and formulating contingencies, as well as a learning experience.

5. ***"Uncertainty Management"*** provides training for another important aspect of skilled decision-making. A common flaw is waiting too long for information, and losing opportunities as a result. To compound this flaw, decision makers sometimes wait for or seek information that is of low value, and/or is unlikely to arrive in time to make a difference. The agencies should train their personnel to appreciate that uncertainty is inevitable, that it is essential to make decisions despite uncertainty, and to gauge the value of seeking additional information versus delaying a decision. We need to be careful in defining what type of uncertainty is to be addressed; there are different types of uncertainty for data elements themselves, inferences based on the data, or projections into the future based on inferences. Different sources of uncertainty also exist, including: missing information items, information items perceived as unreliable, and information that is ambiguous or conflicting.

The uncertainty management training tool identifies the key items of uncertainty in a given situation or scenario presented to the students. This can be done with a Tactical Decision Game or as part of a debrief or critique of an actual incident. Participants in the exercise define the nature of that uncertainty (missing, unreliable, ambiguous, etc.,) and describe an appropriate strategy for managing that uncertainty (to press on, to wait, to actively seek the information considering the likelihood that the data will arrive in time and make a difference, revising the plan to take more contingencies into account, or other types of reactions).

6. ***"Situation Awareness Calibration"*** refers to a technique for improving team decision-making. The technique ensures that all the team members have a common view of events. Just as accurate situation awareness is essential for supervisors to make good decisions, having a reliable shared situation awareness is essential for the coordination of a team or crew. The exercise is primarily intended for use during training scenarios. At a critical juncture, when uncertainty is high, the team leader calls a "time out" and asks everyone to write down his/her answers to a small set of questions, including:

- What is the primary goal right now?
- Why is it the priority goal?
- What is our biggest worry?
- What will happen in the next 15 minutes?

Once done, the team compares notes. If everyone has the same answers, that is a good sign. More commonly, the team members have different answers, and the team can

discuss the reasons for the divergence, and what they can do to prevent these types of divergences in the future, during a real incident. This method (situation awareness calibration) would usually be too time consuming for use during an actual incident. However, in one case, a nuclear power plant crew that had been taught to use this as a training method encountered a minor accident that eventually took 12 hours to resolve. In the middle of the accident, the supervisor actually called a time out, pulled out the list of questions from his situation awareness calibration sheet, and went through them to ensure that everyone had a shared view. He found that there were some divergences which needed to be cleared up. Decision makers may find this a helpful sanity check during wildland firefighting operations, particularly if they feel nervous about whether the other team members have the same perspective they do.

7. The "Commander's Intent Exercise" is designed to improve a leader's skills at communicating what he/she wants to have happen. This exercise is administered in coordination with a Tactical Decision Game. The person who describes his/her solution to the Tactical Decision Game does so in the form of a set of orders, and a description of the intent behind the orders. The person running the exercise then identifies a plausible but unexpected event that will interfere with that plan. The player who issued the orders and intent then writes down how he/she/expects all of the subordinates to react. At the same time, the subordinates write down how they would actually react. Next, the two interpretations are compared. Typically, everyone is surprised by the different interpretations of intent. The point of the exercise is to improve a commander's intent statements, not by providing a checklist of what to say, but rather by providing direct feedback to enable the commander (or potential commander) to find out how people are interpreting orders that he/she thinks seem clear.

The Situation Awareness Calibration method and the Commander's Intent Exercise are variants of Decision Skills Training that are designed to improve team decision-making and to improve communications skills. Under time pressure and other stresses, decision makers may find it difficult to explain things clearly. The ambiguities that creep into their directives can have profound implications. Rather than try to exhort them to think before they speak, or to follow some checklist to produce a clear statement of intent, we find it better to devise a means of feedback that will let decision makers see for themselves the consequences of unclear communications. In a context-bound situation (including a Tactical Decision Game), a decision maker can see the linkage between a poorly-phrased message and the resulting confusions and disagreements. Further, the decision maker can reflect on the way the message would have needed to be

phrased in order to prevent the confusion. Learning sometimes seems to be a simple matter of practice and feedback. However, opportunities for focused feedback for critical skills are difficult to find. Providing those opportunities is the goal of the Decision Skills Training program.

Experience with Decision Skills Training

The type of Decision Skills Training program described above has been used in a variety of environments, including a university graduate program in management, a major municipal fire department, and the firefighters at a petrochemical refinery. The most extensive application has been for the U.S. Marine Corps (USMC), where the goal of the effort was to train approximately 30 squad leaders to handle a variety of decisions during a field exercise. Squad leaders are non-commissioned officers, high school graduates (but usually without college experience) who typically have 4-8 years of experience in the USMC. Their period of training was three and a half months, from November 1996 to late February 1997, but only a few hours per week could be allocated to the decision training.[1]

The motivation for the Marine effort was the establishment of a new Special Purpose Marine Air Ground Task Force (MAGTF). It was designed to rely on a command post that might remain safely at sea during a military operation, thereby reducing the continual need to protect and move it. Consequently the squad leaders and enlisted men were going to have to function very independently. Although the Marines provide a great deal of command training to officers, they provide little, if any, such training to their enlisted personnel. Accordingly, the requirement was to quickly improve the ability of the squad leaders to make judgments and decisions during a large-scale exercise in February-March 1997.

In the field, the battalion had three companies, each with nine squad leaders. The squad leaders for each company were given the decision skills training as a company, so there were three separate groups of nine trained in parallel. The developers of the Decision Skills Training program provided the initial training for each method. Follow-on repetitions were provided by platoon leaders attached to each company. Five of the seven tools described above were used: Decision Requirements Exercise, Tactical Decision Games, Decision Critique, Pre-Mortem Exercise, and the Commander's Intent

[1] The training was conducted by Klein and Associates, a subcontractor to the project and principal author of this Appendix.

Exercise. The uncertainty management and situation awareness calibration tools were not used for lack of time.

The basic concept used for the training was for the Marines to practice decision-making several times a week, particularly using the Tactical Decision Games. Historically, the Marines are strongly motivated to maintain their physical conditioning. They adopted and sold this program as a way to similarly maintain their mental conditioning, recognizing that success would require continuous repetitions.

The Marines who were trained responded very favorably; when the squad leaders were asked to rate the usefulness of the training, the average response was 2.68 on a 3-point scale. The independent raters who evaluated their performance on the Tactical Decision Games noted a sharp increase in the quality of their decisions between the first exercise and the subsequent ones. The informal comments were also very favorable; some of the squad leaders and their platoon leaders attributed much of their high level of performance in the field to the Decision Skills Training.

The U.S. Marine Corps is currently preparing to incorporate a Decision Skills Training program coupled with an OJT program into its training for both senior enlisted personnel and officers. The intent is to make these skills a part of the repertoire of the Marines of the future.

Training for Various Stresses – Surprisingly, research by one of the authors (Klein and Associates) has found that by training people under one kind of stress (e.g., time constraints or high uncertainty), organizations can immunize their decision makers to other stresses (noise, information overload, physical, psychological). Others have found this, too. In addition to the above exercises conducted under time pressures, the U.S. Navy is developing techniques for "stress inoculation" training that could be useful in the wildland firefighting community.[2, 3] Thus decision skills training is also training for decision-making under stress.

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[2] J.F. Driskell and F. Salas (Eds.), Stress and Human Performance, Hillsdale, NJ: Erlbaum, 1996.
[3] J. A. Cannon-Bowers and B. Salas (in press), "Decision-Making Under Stress: Implications for Training and Simulation, Washington, DC: American Psychological Association Press.

Establishing Decision Skills Training for Wildland Firefighting

The steps required to establish a Decision Skills Training program for Federal wildland firefighters are basically similar to those discussed for establishing a formal OJT program:

1. ***Establish the target groups for the program.*** We suggest that the agencies first target Crew Supervisors, the people at the sharp end of the decision hierarchy, who need to make the most time-pressured decisions. Next in priority would be the Strike Team/Task Force Leaders and Division/Group Supervisors, because they also are called on to make many high-stakes decisions.

2. ***Develop the instructional materials and framework***. The starting point for the program could be a course prepared for Crew Supervisors. As with the OJT program, we suggest that this **not** be a one-shot course that would be quickly forgotten. Rather, provision needs to be made to have a series of follow-up sessions to reinforce the use of decision skills. While we suggested a three-part workshop for establishing an OJT program, we recommend that the agencies frame Decision Skills Training as a standard activity each week. It may be good to borrow from the Marines and incorporate it into a "mental conditioning" counterpart to physical conditioning training. This may be more feasible for some types of firefighters than others, e.g., Type I crews, engines, and helitack. Where not feasible, the Decision Skills Training can be offered in a stand-alone course, or as part of another course, or as a training session followed up by refresher training.

   The initial course could be a four-hour program that describes the principles of effective decision-making in the field, and introduces three tools, the Tactical Decision Games, the Decision Requirements, and the Decision Critique. Confusion, rather than clarity, results if all seven tools are covered in the initial presentation. It is best to briefly introduce all seven, but to only provide experience with three. The initial session can use videotaped lectures to describe the overall program and each of the three tools, to cut down on instructor expenses. However, the trainees will need to practice performing the Tactical Decision Games and practice conducting a Decision Critique. It can work well to use a Tactical Decision Game based on a real incident that all have heard about, or an incident in which some of the Crew Supervisors participated. It is also important to use a hands-on exercise for the trainees to identify their own Decision Requirements, in order to feel ownership.

Because of this need for interaction, the workshops are most effective when taught to groups of 8-12 people at a time.

Because the Decision Skills Training program is designed to be conducted in the field, the costs should be minimal. The primary effort will be to prepare the initial training package to teach the Crew Supervisors, Strike Team/Task Force Leaders and Division/Group Supervisors how to use the seven different tools. The initial training package could be presented in a classroom setting, or added to the OJT program and conducted in the field. New Tactical Decision Games can be developed either in-house or by contractors.

Several of the tools can be incorporated into the schedule of actual firefighting operations as "on-the-job" training. The Decision Critique can be used after harrowing experiences, the Pre-Mortem exercise during planning for operations, and the Situation Awareness Calibration checklist in the middle of an operation. When firefighting operations are not being conducted, the other tools could be applied, particularly the regular use of Tactical Decision Games. The Marine Corps Gazette now publishes a new Tactical Decision Game every month, to allow Marines all over the world to try their hand. The magazine also publishes some of the most interesting solutions the following month to provide feedback. A similar approach could be used for the wildland firefighting community, using an existing publication or a new newsletter to publish firefighting Tactical Decision Games (we earlier recommended a new newsletter for disseminating safety case studies).

We envision the Decision Skills Training program as an ongoing drill, a mental conditioning program, rather than as a set of materials to be covered. In the USMC project, the platoon leaders took on the responsibility of running the drills each week. It is not clear how, or if, this could be sustained in the fire agencies.

The USMC is preparing two separate Decision Skills Training courses. One is for senior enlisted Marines, who have a great deal of responsibility in the field. The second course is for officers, who are the decision makers and will be moving upward in responsibilities. The fire community might also require two separate stand-alone courses, one for Crew Supervisors, Strike Team and Task Force Leaders and one for fireline overhead and Incident Management Team members. The Marine courses can provide examples and formats to use as a starting point.

3. ***Selecting Trainers*** – The trainers are likely to discover that they gain a valuable informal evaluation of personnel who participate in this decision training. They also are likely to find that they then can develop their own Tactical Decision Games to remedy areas in which they perceive weaknesses. Therefore, we suggest that the preferred means of running the program is for Operations Section Chiefs to train Division/Group Supervisors and for Division/Group Supervisors to lead the sessions for Crew Supervisors, Strike Team Leaders and Task Force Leaders. The training can be fine-tuned, and the act of training will build relationships as a by-product.

   Incident Management Team members should receive decision skills training in the S-420 and S-520 courses. The decision training described above can be added to these courses.

4. ***Prepare the Organizational Support*** – The required support for Decision Skills Training is much less than for the OJT program. We do not feel that a systematic effort is needed to sustain the Decision Skills Training, especially if an OJT program is established that can be used as a platform for conducting the Decision Skills Training. The requirement to sustain Decision Skills Training is four-fold:
   - Ensure that new Operations Section Chiefs and Division Supervisors as well as S-420 and S1-520 training cadres are prepared to administer the Decision Skills Training program;
   - Ensure that new Crew Supervisors and Strike Team/Task Force Leaders are presented with the Decision Skills Training program;
   - Ensure that there is a mechanism to publish new Tactical Decision Games;
   - Ensure that agency leadership demonstrates an interest in and commitment to the program.

If the agencies can develop this framework to teach decision skills, they will benefit by enhancing leaders' ability to detect problems early and communicate clear assessments and intentions. By providing opportunities to make decisions under time pressure and uncertainty, and by providing exercises to accumulate a larger set of experiences, the training should result in hardened decision makers, prepared to make tough calls, particularly the decisions to avoid or withdraw from risky situations despite organizational pressures to stay the course.

5. ***Evaluation*** – Formal evaluation of a Decision Skills Training Program can be difficult and labor intensive. Observers at the training sessions may inhibit the

participants and take away from active participation in the exercises. However, there are other ways to evaluate the results of the training, such as observing decision performance before and after the course, and polling trainees.

When the USMC used the Tactical Decision Games (and other tools), the platoon leaders commented that they had gained a much stronger appreciation of the abilities of the squad leaders than they had before. In one company, a platoon leader who was in charge of training squad leaders from three different platoons, said that he had a better idea of the decision skills of the squad leaders from the other platoons than their own platoon leaders did.

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